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THE INTERNATIONAL USED SHIP MARKET AS A TEMPORARY SOLUTION TO U.S. SEALIFT REQUIREMENTS

by

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The International Used Ship Market as a Temporary Solution to U.S. Sealift Requirements

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Submitted in partial fulfillment of the requirements for the degree of

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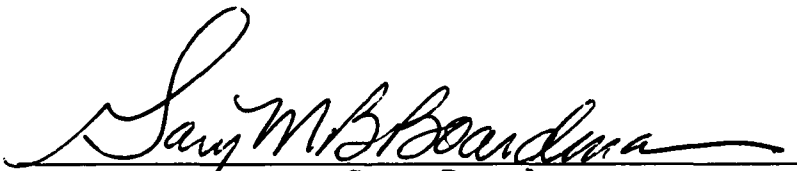
Author: 
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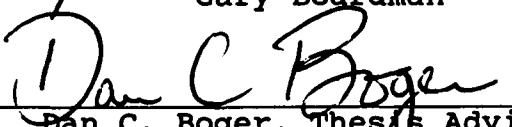
Approved by: 
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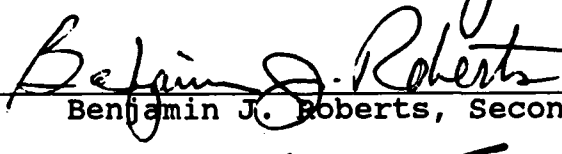
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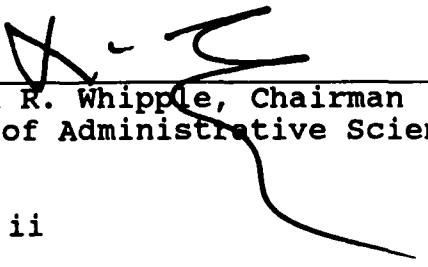
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ABSTRACT

The objective of this thesis is to examine a possible contingency measure of purchasing available ships on the international market to augment existing sealift capabilities prior to or during a crisis situation. This study explores the already existing procurement process that the Military Sealift Command and the Maritime Administration utilize to acquire ships for the Ready Reserve Force. An in-depth set of data was gathered of past ship sales on the worldwide market from 1977 through 1989. The data are intended to explore cyclical patterns, to possibly find explanations as to why prices fluctuate, and to present a legitimate alternative in augmenting sealift by accelerated purchase of used ships.

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I. INTRODUCTION

A. STATEMENT OF PROBLEMS

> The less our forces are forward deployed, the more efficient and effective our sealift and airlift must be to get these forces back into action. [Ref. 1]

> During a general war, more than 95 percent of all military material needed to support our forces would have to be sent by sea, through waters whose control would be contested by a determined adversary; resources and manufactured goods imported by sea would be vital to our defense and civilian industries. A maritime shortfall would therefore mean a shortfall across the spectrum in all segments of our economy and military capability, including our ability to send support to our allies. [Ref. 2]

Radical political changes are occurring throughout the world faster than experts had ever imagined. Political leaders in the U.S. are calling for the reduction of the federal deficit through "peace dividends" while the president of an unstable Soviet Union is consolidating his power. Also, not so well defined is the Warsaw Pact. As this alignment becomes unclear, the threat to Western Europe also begins to become unclear. Drastic changes in Eastern Europe have prompted the United States government to propose troop withdrawals of its NATO forces so as to ensure the same from the Russian government.

The problem arises in the event that these troops may be needed in the future along with other reinforcements from the U.S. In this situation, it becomes an added burden for the U.S. to transport the original troops and equipment that were

withdrawn plus the extra material needed than it does for the Russians to redeploy their men and equipment. The need for strategic sealift becomes even more of an important variable than in the past.

The Third Report of the Commission on Merchant Marine and Defense in 1988 stated a well-known fact to everyone in the transportation industry: that early sealift capability, a vital component of the U.S. defense strategy, has deteriorated. Senator Jeremiah A. Denton (chairman) insisted "that without a strong and healthy maritime industry, the United States cannot carry out its basic national security strategy and that for whatever reason, our government continues to follow a policy of permitting the on going atrophy." [Ref. 2]

In the last 20 years, our civilian fleet of ships capable of ocean trade has plummeted from 843 in 1970 to 369 in 1990 and is forecasted to fall to only 220 in the next 10 years. [Ref. 3] It should be noted that this declining trend is not as bleak as those figures portray; total tonnage carrying capacity has not followed this trend. From 1977 to 1984, gross tonnage of the U.S. merchant fleet has actually grown more than 20%. Between 1987 and 1989 the U.S. fleet expanded by more than two million deadweight tons. [Ref. 4] The shipping industry is based on competitive market principles: operators are forced by economic necessity to maintain only those vessels that are able to compete. This pressure results in the purchase of fewer large ships that have the equivalent

carrying capacity of numerous older vessels. This economy of ship size saves the shipowner associated operating costs such as fuel, labor and port fees. [Ref. 5] Unfortunately, this practice has led to criticism. Because of the above-mentioned design characteristics of present sealift (fewer but larger ships), military planners may be placing precious war materials in "too few baskets".

B. BACKGROUND

Present Defense Guidance mandates that United States strategic mobility assets must continue to meet the inter-theater and intra-theater requirements of a global conventional war. [Ref. 2] These mobility assets include airlift provided by the Military Airlift Command (MAC), sealift provided by the Military Sealift Command (MSC), and cargo handling facilities and personnel provided by the Miliary Traffic Management Command (MTMC). Also included in these assets are privately-owned U.S. and allied ships and aircraft. More than 80% of the fuel, supplies and equipment needed to support Marine amphibious forces alone will have to be carried by civilian merchant ships. [Ref. 6] These requirements are separate from and above requirements for the resupply of U.S. Navy forces at sea.

During war, the strategic mobility assets are required to transport material and supplies to and from areas of need while resupply of naval vessels will be conducted by Combat

Logistic Forces (CLF) ships (assets controlled by the Navy to meet its own requirements of readiness). The CLF presently totals 59 ships, and, according to a 1988 Congressional Budget Office (CBO) study, this number is possibly 34 ships less than adequate to meet Navy resupply goals. [Ref. 7] The extra ships needed to support the Navy will have to be taken from the finite sealift assets available to MSC.

C. OBJECTIVES

Due to the decay of the U.S. maritime industry, MSC has plans to purchase "new" ships for the RRF to augment current assets in the maritime industry. Since MSC is able to purchase ships built in foreign yards [Ref. 8], an in-depth set of data was gathered of past ship sales on the worldwide market from 1977 through 1989. [Ref. 9] The objective of this thesis is to examine a possible contingency measure of purchasing available ships on the international market to augment existing sealift capabilities prior to or during a crisis situation. This study explores the already-existing procurement process that the Military Sealift Command and the Maritime Administration utilize to acquire ships for the Ready Reserve Force. The data are intended to explore cyclical patterns, to possibly find explanations as to why prices fluctuate and to present a legitimate alternative to augment sealift by accelerated purchase of used ships.

D. SCOPE

The following chapter discusses present sealift requirements, the responsibilities of the Military Sealift Command and available assets that are to be used to perform its mission. Chapter III provides an in-depth study of MARAD and MSC's process of acquiring vessels for the RRF by looking at the last Request For Proposal (RFP) solicitation N00033-86-4011. Chapter IV will review the world resale market and look at past trends in order to analyze the best times to purchase sealift assets. Chapter V is a statistical model using regression analysis to determine those variables that most affect the resale values of ships. Chapter VI (Conclusion) is a recommendation that the international market is a viable alternative to acquire needed tonnage in time of emergency.

II. PRESENT SEALIFT CAPABILITIES

A. SEALIFT AUGMENTATION

In a national emergency, merchant shipping will have to augment U.S. Navy sealift. Because of the design characteristics of present civilian merchant shipping, this industry has the natural ability to operate effectively in the following four roles during general mobilization [Ref. 10]:

1. Strategic Sealift: Deploy and resupply U.S. forces in major military operations. Shipping will be required for point-to-point movement to forward staging areas. Additional ships may be used as floating storage facilities in the theater of operations.

2. Mobile Logistic Support Augmentation: Supplement U.S. Navy auxiliary ships in replenishing advance combatant groups. Merchant shipping may be called upon for point-to-point movement of supplies to forward bases, depot replenishment of Naval underway replenishment ships, either moored alongside or underway, and some limited direct replenishment of combatant units.

3. Amphibious Operations: Transport sustaining logistics supply as part of the assault follow-on echelon (AFOE) of an amphibious operation. AFOE shipping will offload onto lighters and causeway ferries.

4. Support of the Civilian Economy: Move the commodities and raw materials needed to maintain the nation's economy and industrial base in wartime. It will be necessary to maintain normal--or even higher--levels of import and export trade, as well as transport of raw materials, manufactured goods, and commodities among U.S. ports.

B. NATO REQUIREMENTS

The obvious situation that will require total mobilization of all available assets and resources will be a NATO-Warsaw Pact type conflict. It is this hostile scenario that will place the greatest strain on our logistical supply lines.

The reinforcement of NATO is broken down into three components, each with separate requirements. [Ref. 11]

1. U.S. and Canadian Military Forces

These forces will need reinforcements and resupply of 8.5 million tons of dry cargo and 15 million tons of petroleum, oil, and lubricants (POL) within the first six months of hostilities.

2. European NATO Military Forces

Require approximately 7.2 million tons of dry cargo and 9.6 million tons of POL within the first six months.

3. NATO Economies

The NATO economies will require large amounts of raw materials to maintain industrial production and civilian consumption. Presently North America imports over 365 million tons annually while Europe imports 945 million tons. Even if a 70% delivery rate were reached, that would mean almost 76 million tons of cargo a month. [Ref. 11]

Figure 1 demonstrates the enormous amounts of raw materials and finished products that will have to be transported to maintain the NATO civilian economies in comparison to that which is required for military use.

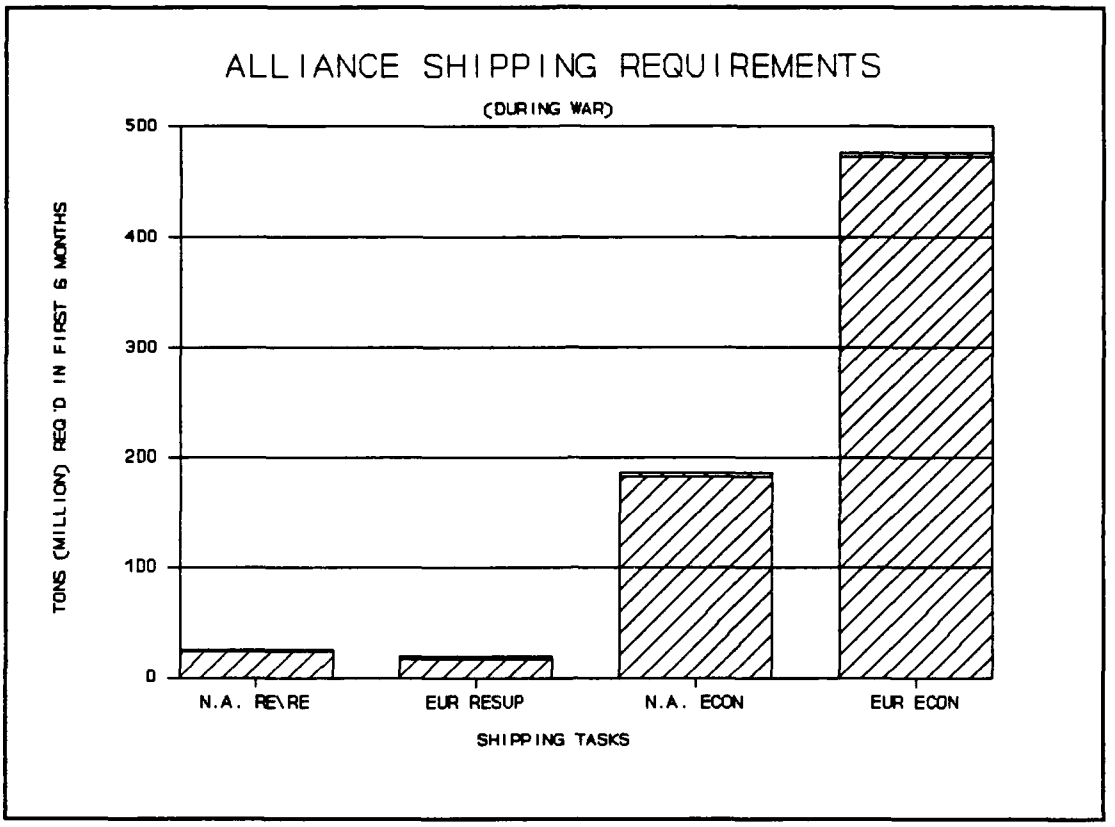


Figure 1. NATO Requirements [Ref. 3]

In a European theater war the U.S. would control its own shipping but would coordinate sealift needs and priorities with its NATO allies. Now, fewer than 300 ships of the U.S. merchant fleet, including ships of the RRF, are suitable for the NATO reinforcement fleet. Conflicting needs could reduce the number of ships available for U.S. use. [Ref. 12]

C. FLAGS OF CONVENIENCE

The world merchant fleet is composed of a large portion of ships that are registered under what is termed flags of

convenience (FOC). These ships take advantage of cheaper registration requirements mandated by countries such as Liberia, Panama, and Singapore.

Figure 2 demonstrates the large portion of vessels that seek to profit from the less stringent conditions made available by the FOC nations. The FOC vessels account for 27.5% of the total world fleet. NATO claims 20.6%, while the Warsaw Pact accounts for 14.1% of the remaining vessels. Japan and China have 5.4% and 5.2% respectively and the remaining 27.2% are distributed to "other" nations. [Ref. 11]

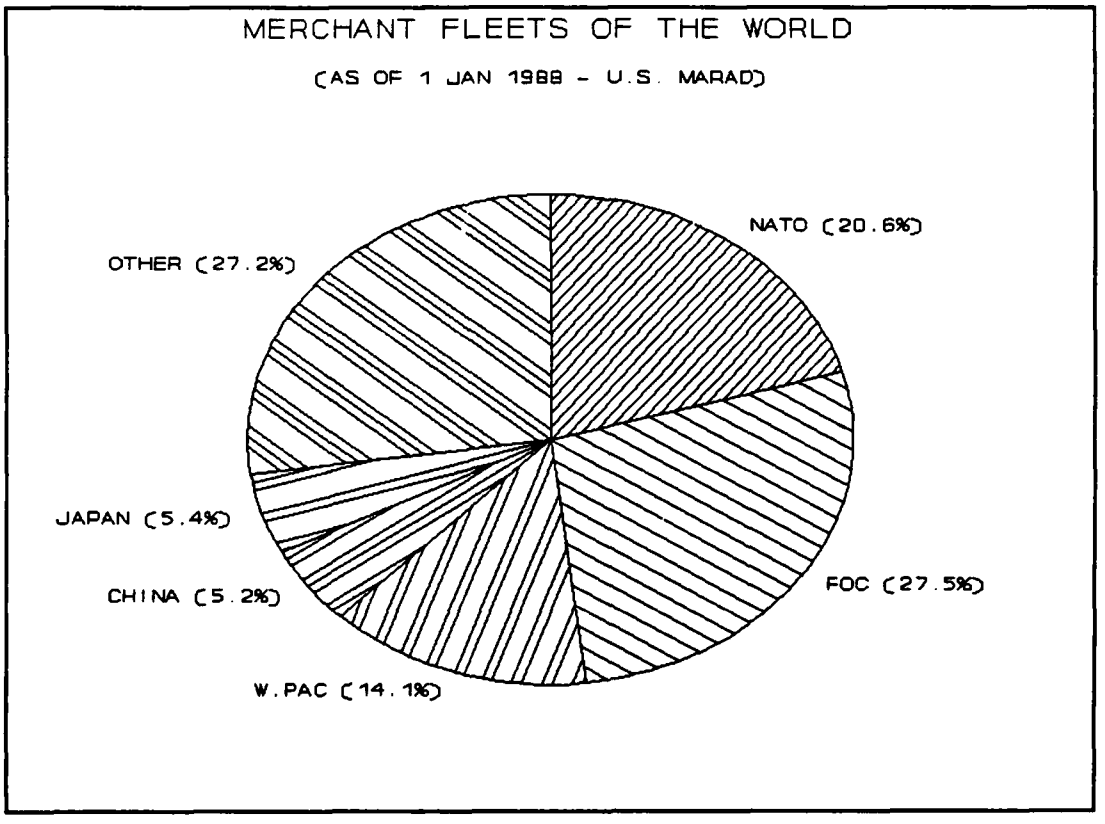


Figure 2. Control of Shipping [Ref. 3]

D. THE EFFECTIVE U.S. CONTROLLED FLEET (EUSC)

Many U.S. companies own ships that are registered under foreign flags for the sake of economic advantage. The Maritime Administration, with the Military Sealift Command, is counting on a number of these foreign-flag ships in a national emergency. Under the Merchant Marine Act, foreign-registered ships owned by U.S. citizens are subject to requisitioning in an emergency. Unfortunately, the outcome of calling up these ships to help transport American supplies has never been tested. [Ref. 12]

> The EUSC fleet has a significant number of ships but most of them are either tankers or gearless bulkers, both of which are of limited utility for military sealift augmentation but have substantial value to the economic sustainability of our industrial base. Moreover, questions have been raised about the wisdom of relying on the EUSC fleet. The understandings between the U.S. and the various flag-of-convenience countries are based on agreements, not treaties, and are in effect during friendly relations only. In past years, anti-U.S. feeling and waves of nationalism have swept through Third World countries. Sympathy for U.S. policies and goals is questionable. In addition, all these ships are manned by foreign crews of mixed nationality, some of whom may not be sympathetic to the United States or its policies and might not sail for U.S. military support. [Ref. 12]

E. PRIVATE SECTOR U.S. SHIPPING

Since 1979, the U.S. percentage of total liner trade transported by American ships has dropped from 27.5% to 14.9%. [Ref. 13] Numerous arguments have been presented for lack of competitiveness in our merchant marine. U.S. ship owners contend that purchasing and operating a U.S. flag vessel is too expensive. Investors are also wary due to the poor

returns on investment that this business offers. Many people in this industry lay part of the blame on the once strong maritime unions while others point at the stringent Coast Guard requirements. On the ship construction side, U.S. built ships cost millions more to produce stateside than abroad. [Ref. 14]

Many maritime supporters have introduced programs such as "Defense Readiness Contracts" in which to revitalize our ailing maritime industry. Similar efforts have been proposed by U.S. shipbuilders to bring back new types of Construction Differential Subsidies (CDS) that would offer benefits to the ship owner of a military useful ship, while at the same time lobbying Congress to put pressure on foreign governments to cease subsidies to their yards. This political gamesmanship is a determined effort by U.S yards to establish a "fair playing field" in which to compete. Unfortunately, ship operators request alternate solutions to mend their competitive problems in the international market. [Ref. 13]

In an attempt to unravel the dilemma that our merchant marine is facing, lawmakers have unsuccessfully tried to segregate the two sectors, that is, the ship operating industry and the shipbuilding industry. Some enthusiasts have urged Congress to eliminate the requirements that U.S. flag vessels capable of Jones Act trade be U.S. built. This legitimate proposal has much interest and support in the operator's arena. Warren Leback, the Maritime Administrator,

revealed a proposed plan in 1989 that would allow shipping companies to purchase the cheaper foreign built hulls during a "window of availability" similar to that of 1982. This is a reasonable concept until confronted with the problem of the U.S. shipyards. Since 1978, 55 shipyards have closed and more than 60,000 workers have lost their jobs. [Ref. 15] Even though the yards have not completed a commercial hull since 1987, they still maintain a strong lobby on Capitol Hill. The Shipbuilder's Council of America has yet to let Congress separate the maritime industry into ship operators and shipbuilders. Until the shipping companies can detach themselves from the stagnant U.S. commercial yards, it will be extremely difficult to get any piece of legislation passed allowing foreign built ships to participate in this market.

F. USTRANSCOM

In 1987, the U.S. Transportation Command (USTRANSCOM) was established. The Military Sealift Command (MSC), as well as the Military Airlift Command (MAC) and Military Traffic Management Command (MTMC), were designated as component commands to USTRANSCOM. During peacetime, each of these commands operate separately from each other and USTRANSCOM; it is only in planning and time of war that they operate as a completely coordinated unit. [Ref. 16]

1. Military Sealift Command

The Military Sealift Command's primary mission is to provide adequate numbers of ships to fleet support and special missions in peacetime and strategic sealift in wartime. MSC's responsibility is to transport material overseas that is uneconomical to move by air; presently 95% of the dry cargo and 99% of liquid cargo require this mode. [Ref. 17] MSC maintains and operates a fleet of 371 ships. Some of these ships are chartered from civilian companies and others are owned by the government. [Ref. 6]

MSC realizes the danger of a declining merchant marine as well as the peril of possible economic reprisals faced by depending on foreign flag vessels to transport our import and export materials. At present, the U.S. merchant marine carries only about 4% of U.S. import and export ocean trade. By reviewing MSC's future projections it is obvious, but not stated, that MSC is willing to rely less and less on the dwindling civilian fleet. The Ready Reserve Force is programed to be increased to 142 ships by 1994. That is an augment of 49 "new" ships in the next four years. [Ref. 6]

2. Ready Reserve Force

The Ready Reserve Fleet (RRF) consists of former commercial ships purchased by the U.S. government and maintained by the Maritime Administration (MARAD) under a memorandum of understanding between the Navy and the Department of Transportation. MARAD was granted this custody

because it was already in charge of maintaining the National Defense Reserve Force (NDRF) and has the available assets to maintain ships in a laid up condition. [Ref. 17] The RRF ships are sustained in a five, ten, or 20-day readiness posture and are located at ports on the Pacific, Atlantic and Gulf Coasts. Each vessel has the requirement to be broken out once every five years. They are to be manned by an available pool of qualified civilian mariners. (Some serious doubts exist that the manning resources will be sufficiently available to operate these ships in time of emergency. The majority of these ships are non-automated and steam powered, requiring extensive manpower and experience that is no longer readily available.) At the close of 1989, the RRF totaled 93 ships (83 cargo ships, nine tankers, and one troop ship) with a goal of 142 ships by 1994. [Ref. 6]

3. Existing Assets

At present, our total maritime capability has fallen to only 751 ships (Table 1), while at the same time maintaining a relative stable world ranking of eighth in total tonnage (Table II). In analysis, as U.S. private sector shipping continues to decline, the U.S. government augments its capabilities. Unfortunately, a major portion of U.S. sealift is already controlled by governmental agencies.

No solution would be more beneficial to meet our strategic sealift requirements than to have a strong and self-sufficient U.S. maritime industry, but, at its present state,

TABLE I

AVAILABLE ASSETS (MSC, MARAD, CNA)

ORGANIZATIONS	# OF SHIPS
MSC	93
RRF	93
NDRF	137
CLF	59
US COMMERCIAL	369
TOTAL	751

TABLE II

PRINCIPAL MERCHANT FLEETS MARCH 1989 DWT (,000) [Ref. 4]

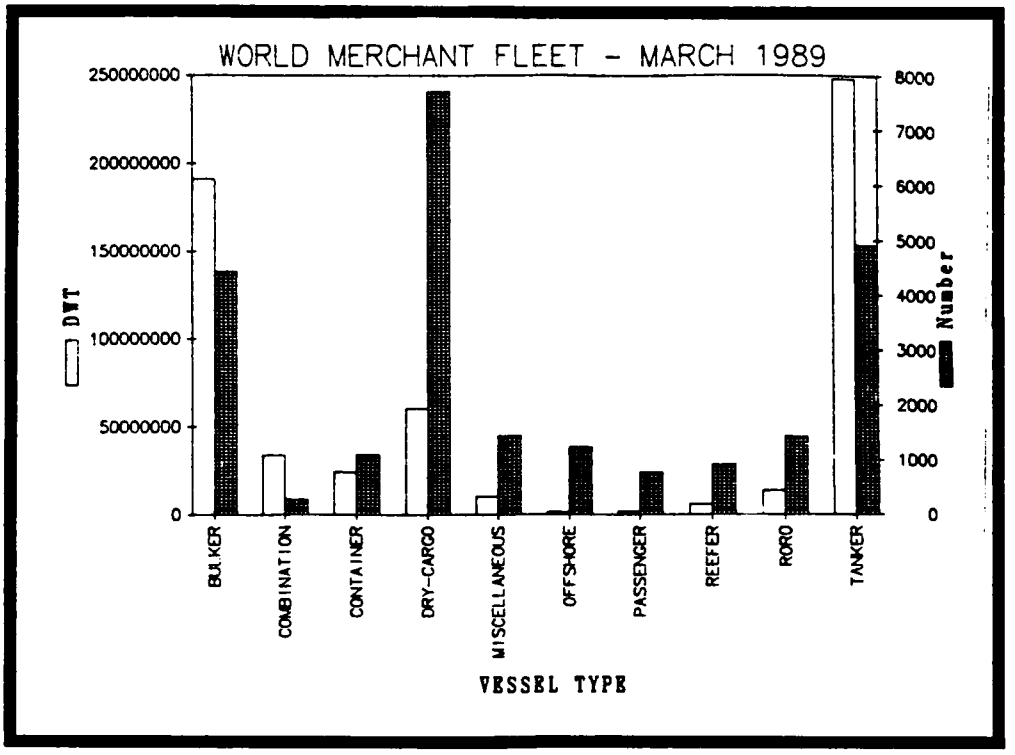
Liberia	83,570 dwt
Panama	66,879 dwt
Japan	41,964 dwt
Greece	36,526 dwt
Cyprus	32,065 dwt
Norway	23,506 dwt
USSR	21,844 dwt
USA	21,653 dwt

the U.S. merchant marine is anything but strong and self-sufficient. Until this situation is solved by the present or future administration and industry leaders, our nation is placing itself at risk by relying on decreasing U.S. and allied assets. It is obvious that the Military Sealift Command realizes this dilemma and has tried to augment its present capabilities with the purchase of used vessels for its Ready Reserve Force.

In time of national emergency and prior to a resurgence of our maritime industry, it is a viable contention that the United States government, through MSC and MARAD, can acquire sealift assets on the international market. Table III demonstrates that a vast quantity of ships exist; however, these ships would probably not meet all the stringent USCG requirements nor the specifications mandatory for MSC's RRF ships, but they would provide the nation with a temporary solution to the transportation of war materials. These ships, the vast majority of which are diesel powered and of relatively new construction (versus the ancient steam ships that are currently maintained in the NDRF and, in some instances, the RRF), would be less complicated to operate thus making them easier to man.

TABLE III

EXISTING MERCHANT SHIPS [Ref. 4]



III. MSC/MARAD SHIP ACQUISITION PROCEDURES

The Denton Commission Report, while offering advice on how to revive our sick maritime industry, unfortunately criticizes MSC policy on many fronts. [Ref. 2] Two points directly criticize the Military Sealift Command's acquisition process for the RRF: (1) The Commission feels that even with the increase of 49 ships in the RRF, MSC will still not be able to fulfill the requirements necessary during a strategic sealift; and (2) The bid process, required by federal regulations that mandate the use of the Competition in Contracting Act (CICA) and the Federal Acquisition Regulation (FAR), is causing devastating damage to the entire industry.

A. COMPETITIVE PURCHASING

In obtaining sealift, MSC, by law, relies on full and open competition, seeking the best value for the government at the best price. Like the rest of the federal government, MSC must acquire its assets by following the laws set up by Congress and administered by the Executive branch. MSC and MARAD feel that a strong U.S. merchant marine is the most practical and least expensive way in which to accomplish its mission of providing the nation with sealift capabilities. It is the Military Sealift Command's objective to only purchase

those ships that are no longer considered to be of private economic use.

To review the acquisition process of most items purchased for the government, an acquisition plan is normally the primary document drawn up by an appointed program manager. However, due to the peculiar circumstances of MSC having to procure material that has already been manufactured and that is already in use by the civilian industry, MSC is exempt from having to formulate an acquisition plan or strategy. What is required, however, is for MSC to establish what type of vessels it is seeking in the used ship market and then [usually] to submit its request to MARAD. Once a requirement is established, MARAD issues a request for proposals to ship owners to bid their qualified ships for purchase by the government. Once the RFP is received, the owner has a limited amount of time to ensure that the vessel meets all requirements while at the same time determine a submission price that accounts not only for the vessel itself but other criteria such as necessary conversions or lay up procedures. The purchase is accomplished under a negotiated contract if the government feels that the offer was both responsive as well as made by a responsible bidder. The government will then negotiate the price to ensure all specifications can be met.

Both MSC and MARAD have the ability to purchase used ships for the RRF, but the dissimilarity is that MSC sets up the guidance and directs MARAD on what type of ships to purchase.

MSC establishes the criteria, military utility and weights for each type of ship that the Source Selection Evaluation Board (SSEB) utilizes to determine those ships that will ultimately be purchased. In FY 1990, funding for the RRF became the responsibility of MARAD and $32.4 million were included in their budget for fleet additions and acquisitions. Presently, MSC has asked for $49.4 million for the addition of five ships to the Ready Reserve Force in 1991. [Ref. 18]

B. OPPORTUNISTIC PURCHASES

Although it should be noted that MARAD cannot submit any request for proposals without MSC instructions, MARAD usually has no futuristic or long-range plan on what type of ships and when these potential RRF ships are required. [Ref. 37] At the same time MSC is restricted by the amounts of budgetary resources available for the purchase of these ships. Because of this process, MSC has the potential ability to take advantage of unforseen world events in the civilian industry so as to purchase ships it needs at the lowest cost. If a long-range plan with milestones was to be required, MSC would not be able to react quickly to new situations. For example, at the moment MSC is keeping a close watch on the political situation caused by the Exxon Valdez. Congress is debating legislation which would require tankers in U.S. trade to be constructed with double hulls. If this requirement was to pass, then MSC could possibly purchase the then-obsolete

single hull ships at bargain prices and place them in the RRF. At present, MSC's RRF ships do not have to meet all civil-sector requirements because their purpose is to stay in a laid-up condition until an emergency. MSC also has the ability to purchase certain types of foreign-built vessels due to the fact that too few ships in the tanker, semi-submersible heavy-lift, and RO/RO ship categories were ever built in the U.S. to meet MSC requirements. [Ref. 8]

C. REQUEST FOR PROPOSAL (REQUIREMENTS)

As of February 14, 1990, the Maritime Administration has not acquired any vessels in the past two budget years. At present, a new proposal is about to be sent out. The most recent purchases were made through the Military Sealift Command Contracting Division under solicitation number N00033-86-4C11. A detailed review of this request for proposal (RFP) will demonstrate what is actually required prior to a ship being purchased by the U.S. government.

An "Information To Offerors or Quoters" was sent out by Military Sealift Command Code M-10-4 for unrestricted procurement of "various vessels for the Ready Reserve Force." The negotiated RFP highlighted that offerors were cautioned that any procurement action resulting from a response to this Request for Proposals is contingent upon the availability of funds.

1. Priority of Purchases

The most recent Request for Proposal (RFP N00033-86-4011) indicates that the Military Sealift Command is interested in acquiring the following types of ships in order of priority [Ref. 19]:

1. Tankers
2. Breakbulk ships (Fast)
3. Semi-submersible heavy lift
4. T-ACS (crane) candidate ships
5. Roll-on/roll-off ships.

2. Specific Requirements

The following are specific requirements for each ship type.

a. Tankers

1. Must have been built since 1965 (1986 RFP)
2. Deadweight tonnage between 20,000-100,000 DWT
3. Must have coated tanks for jet fuel
4. Must be able to transit Suez & Panama Canals
5. Maintain speed of 13.5 knots fully loaded
6. May be foreign built but must be U.S. documented at time of sale
7. Must have range of 10,000 nm at 13.5 kts.

b. Breakbulk Ships "FAST"

1. Must have been built since 1965 (1986 RFP)
2. Must meet Suez and Panama Canal restrictions
3. Maintain speed of 20 kts

4. Must have a minimum bale capacity of 400,000 cubic ft.

5. Must be of U.S. construction

6. Must have range of 10,000 nm at 20 kts.

c. Semi-submersible Heavy-lift Ships

1. Must have been built since 1965 (1986 RFP)

2. Must meet Suez and Panama Canal restrictions

3. Must be able to lift 1000 Lt. and carry 4 LCU's

4. Must maintain a speed of 12 kts

5. May be foreign built but documented U.S.

6. Must have a range of 10,000 nm at 8 kts.

d. T-ACS Candidate Ships

1. Must have been built or rebuilt since 1965

2. Length NLT 550 ft and NMT 825 ft loaded

3. 250 ft of continuous clean weather deck space

4. Breadth 73'-92', depth molded 40'-55'

5. Must be of U.S. Construction

6. Must maintain a speed of 17 kts for 10,000 nm.

e. Roll-on/Roll-off Ships

1. Must have been built since 1965

2. Must meet Suez and Panama Canal restrictions

3. Must be equipped with stern ramp

4. Must have 70,000 sq. ft. of below deck Roll-on/Roll-off space

5. Must attain speeds of 17 kts for 10,000 nm when fully loaded

6. May be foreign built but documented U.S.

3. Evaluation and Award

a. Proposals

Proposals will be evaluated in descending order on the basis of price, military utility and MSC program balance in accordance with the following priorities:

1. Clean product tankers
2. Fast breakbulk ships
3. Semi-submersible heavy lift ships
4. Container ships capable of being converted into T-ACS (crane ships)
5. Roll-on/Roll-off ships.

b. Price Evaluation

Price evaluation is determined by calculating the cost per unit lift of each ship type.

c. Military Utility

Military utility is evaluated separately for each type of vessel. Performance criteria are established per category of ship type and what may be considered of extreme value in one class of vessel may not be evaluated in other classes. The following factors are in descending order of importance to show differences in grading criteria.

(1) Tanker.

1. Capability to carry more than two grades of petroleum
2. Cruising range at 13.5 knots
3. Maximum sustained speed
4. Bow thruster

5. Fuel consumption

⇓

12. Age

13. Passenger capacity.

(2) Breakbulk.

1. Bale cube excluding deep tanks

2. Maximum sustained speed fully laden

3. Main deck fore/aft fork lift access

4. Number of holds with tween decks

5. Average of max cargo lift capacity

⇓

11. Age

12. Passenger capacity.

(3) Heavy Lift Ships.

1. Number of LCU's (Landing Craft Utility) that can be carried

2. Maximum heavy lift capacity

3. Amount of deck area with minimum of 525 psf

4. Percent of deck area with capacity in excess of 525 psf

5. Number of modes of lift (RO/RO etc) in addition to required semi-submersible mode

⇓

17. Single vs. multiple engines

18. Fuel type required.

Note: age is #10

(4) T-ACS Candidate Ship.

1. Age
2. Length
3. Continuous clear deck space
4. Beam
5. Depth

⇓

10. Number of sister ships owned by U.S. government
11. Bow thruster.

(5) RO/RO Ships.

1. RO/RO sq ft capacity
2. Number and type of ramps
3. Below deck capacity in excess of minimum 70,000 sq ft with 13 foot overhead at 525 psf
4. RO/RO capacity in excess of minimum (30,000 sq ft) excluding that included in (3)
5. Cruising range--fully loaded at 17 knots

⇓

19. Ramp vs. elevator lift
20. Fuel type.

Note: age is #10

As the RFP is answered by the various bidders, MARAD determines if they meet the requirements specified by the proposal. It is at this point that the ships are evaluated by the Source Selection Evaluation Board (SSEB). Each offeror's proposal is evaluated within a ship priority category on the basis of price and military utility. As

mentioned in the RFP, the price is calculated as price per unit lift. Awards will be made on this basis, as well as the fact that the ship fits into the existing fleet and is within funding constraints.

4. Inspection and Acceptance

Inspection is required and performed by the Commander, Military Sealift Command, prior to any purchase based on validation of the operational performance of the ship during sea trials. This inspection includes propulsion systems through food handling.

5. Delivery

MSC requires that all ships be delivered free on board (FOB) to the delivery point within 180 days after award. The various ports are given for each type of vessel. If changes to delivery site are altered, a rate adjustment will be made. Upon delivery, the ship will be jointly surveyed to ensure that it is in compliance with conditions of agreement. Any disputes will be judged by an American Bureau of Shipping (ABS) surveyor and shall be binding on both MSC and offeror.

Prior to delivery of the vessel the contractor shall:

1. Document the vessel under the U. S. Flag in accordance with all USCG requirements.
2. Ensure that vessels shall meet USCG and American Bureau of Shipping (ABS) standards and be in a class A-1 (highest) category.
3. Ensure that tankers who don't meet requirements concerning segregated ballast are eligible for waiver.
4. Provide all technical drawings.
5. Ensure that no outstanding discrepancy reports exist.

6. Ensure that the vessel is able to be fully operational in all respects and capable of steaming continuously for 180 days.
7. Ensure that the vessel is in an environmentally acceptable condition, i.e., no deteriorated asbestos.
8. Ensure that each ship is clean and in a well-preserved condition
   a) No rust or exposed equipment
   b) The ship shall be free from vermin, insects and rodents (clean)
9. Deactivate and prepare the vessel in accordance with revised MARAD vessel deactivation procedures.
10. Arrange, supervise, and effect the recording of the Bill of Sale.
11. Validate the operational performance of the ship(s) and associated equipment in accordance with government's report titled OPERATIONAL PERFORMANCE SEA TRIALS. The cost to repair any defect or correct any deficiency will be included in the price of the contract.
12. Have on-board sufficient fuel oil and lube oil for five days steaming at maximum sustained speed.
13. Ensure painting is per MSC instructions.
14. Ensure sufficient radio communication suit as outlined per FCC rules, i.e., satellite communications, radars, and other various radios.
15. Tow the vessel to the designated site, dehumidification is required.
16. Ensure 100% of ships allowance list shall be on board, stowed and documented.
17. Provide a list of items deemed part of vessel at delivery, i.e., documents, certificates, unused fuel, oil, unused stores, etc.

6. Special Contract Requirements

The warranty requires only that the vessel(s) delivered meet and comply with USCG, ABS, FCC, U.S. Public Health Service, and International Convention of Safety of Life at Sea requirements. The vessel must be free and clear of all liens and encumbrances. The warranty also states that cancellation, if deemed necessary because of major deficiencies prior to delivery, will be at no cost to the government. Repair work or conversion is to be accomplished

only in U.S. shipyards. Vessels from communist areas are ineligible for consideration.

7. Actual Purchase

The last RFP (N00033-86-4011) had five to six responses in every category. The source selection authority approved nine vessels with a total procurement of eight. The ninth ship was determined by the offeror to still be of commercial value and was placed back into service with no cost to the government. The purchased ships were those that could no longer can compete economically in the private sector; active U.S. commercial ships are a cheaper form of sealift capability than purchasing them outright. Some of the responses to the proposal were made by foreign-built ship owners, but they could not underbid the eight U.S.-built ships that won the awards. [Ref. 20]

The ships shown in Table IV were purchased under RFP (N00033-86-4011) and were placed in the RRF by early 1988. The price paid for each vessel was considerably higher than the market value during that time frame. This indicates that there is a high cost associated with the complex requirements that these vessels must meet to be placed into the RRF.

These successful offeror(s) under the direction of Commander, Military Sealift Command, were instructed to furnish the above vessels in tight, staunch, strong and well and sufficiently tackled, furnished and equipped. The vessel,

TABLE IV

PURCHASED SHIPS [Ref. 20]

NAME OF VESSEL		PRICE SOLD
S.S. SPIRIT OF LIBERTY	(TANKER)	9.0 million
S.S. FALCON LADY	(TANKER)	10.7 million
S.S. RAPID	(RO/RO)	8.5 million
S.S. TYSON LYKES	(RO/RO)	15.0 million
S.S. PRESIDENT JACKSON	(CARGO)	7.5 million
S.S. PRESIDENT ADAMS	(CARGO)	7.5 million
S.S. FEDNAV EXPRESS	(RO/RO)	14.5 million
S.S. FEDNAV SEAWAYS	(RO/RO)	14.5 million

in every respect, will be seaworthy, in good running condition and repair and in all respect fit for service.

D. OTHER POSSIBILITIES

Until the U.S. maritime industry is able to meet all requirements on its own, the purchase of sealift is not the only method in which the U.S. must depend upon to transport needed materials. Many other options are available to meet these requirements, two of which include chartering and political acquisition.

1. Charter Market

In the commercial sphere, many shippers or shipping companies often prefer to acquire their shipping assets through the charter market versus buying the assets. This option enables the would-be shipowner to have the use of a

vessel but not the economic risk of such an investment, freeing up capital for other purposes. This charter market exists primarily to take advantage of this type of shipper demand. The vessel types most commonly chartered are tankers and bulker ships. Professional shipowners will purchase these vessels with the specific intent to cater to this demand by either subcontracting by volume of cargo for a fixed fee per ton or by renting the entire ship out for a specified period of time. The Military Sealift Command operates many of its existing assets in this manner.

2. Political Acquisition

During the Iran/Iraq war, the U.S. government utilized a system of reflagging Kuwait tankers to U.S. registry that called on ports in the Persian Gulf. To establish credibility, a company office was opened in the U.S. as well as replacing key licensed personnel on the ship. This process was for politically different reasons than the acquisition of sealift but can also be used as another alternative in adding sealift to aid in an emergency.

IV. THE FLUCTUATING WORLD RESALE MARKET

A. PURPOSE AND METHODOLOGY

This chapter is a study of fluctuating merchant ship prices in the international market. Its purpose is to explain past trends in the bulker, cargo and tanker used ship sales.

The data gathered to perform this study were taken from Fairplay Weekly [Ref. 9], a periodical which lists ships sold, ship characteristics and price sold. The data were listed in alphabetical order and it was in this order that the data were accumulated. Five ships of the three separate ship types were chosen randomly at the beginning of each quarter of each year, generating a total of 20 vessels per type per year. The ships had to meet two criteria: they could be no more than 20 years of age and must exceed 1000 gross registered tons (GRT). The data were accumulated from 1977 to 1989 generating a data base of 260 ships of each type.

A total price paid and a total tonnage was calculated for each class of ship for each year. By dividing the total price paid by the total tonnage, the price per ton for that year is calculated. The price per ton and the average age at sale date were then consolidated in Table V and graphed to show the cyclical patterns that this market experienced. The purpose of this chapter is to provide some background on causes of these cyclic patterns.

TABLE V

AVERAGED DATA

	BULKER		CARGO		TANKER	
YR SOLD	AVG AGE	PRICE/ TON	AVG AGE	PRICE/ TON	AVG AGE	PRICE/ TON
77	9.75	329	8.95	490	7.9	64
78	9.65	148	13.15	187	9	59
79	8.7	353	12.9	273	10.2	108
80	8.8	507	9.85	526	8.75	160
81	11.35	412	13.55	417	12.45	49
82	11.8	195	12.35	266	10.15	41
83	11.8	143	9.95	285	10.05	26
84	12.8	155	10.5	276	10.5	38
85	11	130	11.35	147	9.85	54
86	10.1	96	11.55	127	12.1	33
87	12.6	114	11	218	12.6	79
88	12.9	242	13.4	334	12.5	98
89	13.8	345	14	510	11.65	239

B. PARAMETER DEFINITIONS

1. Gross Registered Ton (GRT)

GRT is a volume measure of the total enclosed space of the ship (with certain space exemptions for those spaces utilized in operating the ship) in tons of 100 cubic feet each. [Ref. 21]

2. Deadweight Tonnnage (DWT)

DWT is the measure of weight that a ship is permitted to carry. DWT indicates the maximum weight of cargo, fuel, stores and potable water. [Ref. 21]

C. SHIP TYPES AND USES

1. Bulker

The dry bulk carrier is a ship that is designed with hatches and without tween decks. These ships are either geared (self-loading and unloading equipment) or gearless, with the majority being the latter. They are intended to carry a single commodity during a voyage but are built to take advantage of a variety of types of cargo. The major commodities that are carried by these ships are ore, coal and grain. Most of these ships are built in the 15,000-30,000 grt range with speeds averaging 14-15 knots. [Ref. 22] As described previously, the bulker was not a vessel that the Military Sealift Command was looking for in its present RFP. In time of national emergency, this type of ship will be required to carry the necessary raw materials to the U.S. and our allies for the production of finished products. Unfortunately, the U.S. has the fewest of these types of vessels. [Ref. 10] It should also be mentioned that many bulkers are equipped to carry ore, bulk or oil. These ships are called O/B/O's and are of military useful design. [Ref. 10] It is possibly misleading that this study grouped the

many types of bulkers together, but it is beyond the scope of this study to break out the various subcategories in each type.

2. Cargo Ship (Breakbulk)

The cargo ship, also called a freighter, is a flexible vessel built with the intent of carrying an abundance of types of cargoes ranging from bulk grain to military vehicles. It differs from specialty-type cargo ships such as the container ship in the sense that it is built to handle all sorts of cargo. The general cargo ship is usually a sturdily-built ship that encompasses many holds, each with numerous tween decks that allow the maximum amount of cargo to be placed within each hatch or hold and not having to be stowed on top of other cargo. The breakbulk ship is equipped with its own cargo handling gear in the form of booms or cranes. The cargo is usually loaded by stevedores working the ship's gear by means of slings or cargo nets. This self-supporting method of cargo transfer enables the ship to call on ports without having to rely on shore-based equipment making the ship militarily useful in conflict areas involving lesser developed countries. The average general cargo ship normally operates at speeds of 15 knots; however, many are capable of attaining marginally higher speeds. [Ref. 23]

In recent years, the labor-intensive breakbulk ship has seen its market share in the liner trade overshadowed by the fast and highly efficient container fleets now utilized to

transport most general cargo. [Ref. 5] In response to this competition, breakbulk ships have had to adapt to the changing market and more and more ships have been built along a multipurpose role. The multipurpose ships are able to load a limited amount of containers efficiently while still being able to perform in the classic breakbulk environment.

3. Tanker

The tanker is a vessel designed to carry liquid products in bulk form. These ships are built with numerous storage tanks and intricate piping systems that enable the ship's crew to pump the cargo ashore or transfer it to various holds via high capacity pumps. The basic tanker carries crude oil or its derivatives: gasoline, diesel fuel, kerosene and jet fuel. It should be noted that the type of cargo the tanker carries usually specifies the ship's design. In the crude oil trade, Very Large Crude Carriers (VLCC) ships in the 150,000 DWT and over range, transport oil to refineries. Liquid Natural Gas (LNG) carriers are specially built to transport natural gas at extremely low temperatures. The tanker that is deemed most valuable in the military context is that of the "handy size" of between 6000 and 35,000 DWT. This vessel is designed to carry refined or clean products thus making it suitable for transporting military fuels. [Ref. 24]

4. Semi-Submersible Heavy-Lift

The semi-submersible heavy-lift ship was originally designed to transport weights (usually loads of 100 tons or

more) that the liner industry could not. Heavy-lift ships are designed to onload their cargo by either the use of Stulken cranes or by partial submersion of the vessel itself while the cargo is floated on. [Ref. 5]

5. Roll-On/Roll-Off

The Roll-On/Roll-Off (RO/RO) is a cargo vessel designed to utilize a built-in ramp to load and discharge cargo. This concept of ship was developed in the late 1920's in the U.S. to transport freight cars and wheeled vehicles. The vast majority of general cargo is carried by containership. However, due to the containership's specialization, not all cargo can be transported by this service. What the RO/RO gives up in wasted cargo space it gains in flexibility. The RO/RO's configuration is specially suited for carrying any wheeled vehicle or any commodity that is too bulky to fit in a container but can be maneuvered by a forklift. Many RO/RO ships are built with some container-carrying capacity but, at the same time, their cargo decks are adjustable to allow for maximum stowage or the capability to carry oversized wheeled vehicles. The RO/RO's main advantage over the general breakbulk ship is that it is able to call on the same ports, and, at the same time, load and unload at quicker rates. Regarding military utility, the RO/RO is a perfect mode of transport for military tanks, armored personnel carriers, trucks, etc. [Ref. 5]

D. EFFECTS ON SHIP PRICES

Secondhand ship prices are affected by new building prices and by freight rates. [Ref. 25] Both new building costs and freight rates are affected by industrialized nations' economic states.

Much of the economic growth in the postwar period has been the result of international trade. Recent studies have demonstrated that when the economies of OECD countries grow by more than 1.5% to 2% per year, non-oil imports grow at a slightly higher rate. The inverse is true for zero growth years resulting in approximately a 5% drop in non-oil imports. [Ref. 12] As national economies fluctuate, so, too, do the commodities that are traded on the international market. In this sense the shipping industry closely follows economic activity.

The shipping industry is a service-oriented business. Its "product" is to transport goods to destinations where they are needed. Like all products that are offered in a market environment, they are exchanged according to the rules of supply and demand. Demand, Q(D), may be defined as being that quantity of service needed to move world seaborne trade. This is determined by freight rates. The supply side of the market for shipping services is given by the amount of tonnage available, Q(S), including ships in lay up, and is determined by freight rates and fuel costs. At equilibrium, Q(D) = Q(S),

maintaining an efficient use of assets by both shippers and ship owners. [Ref. 26]

Any change in world trade patterns, freight rates or fuel cost will shift the equilibrium. For example, if fuel costs rise proportionately to the freight rates then potential profits are offset by the higher operating costs.

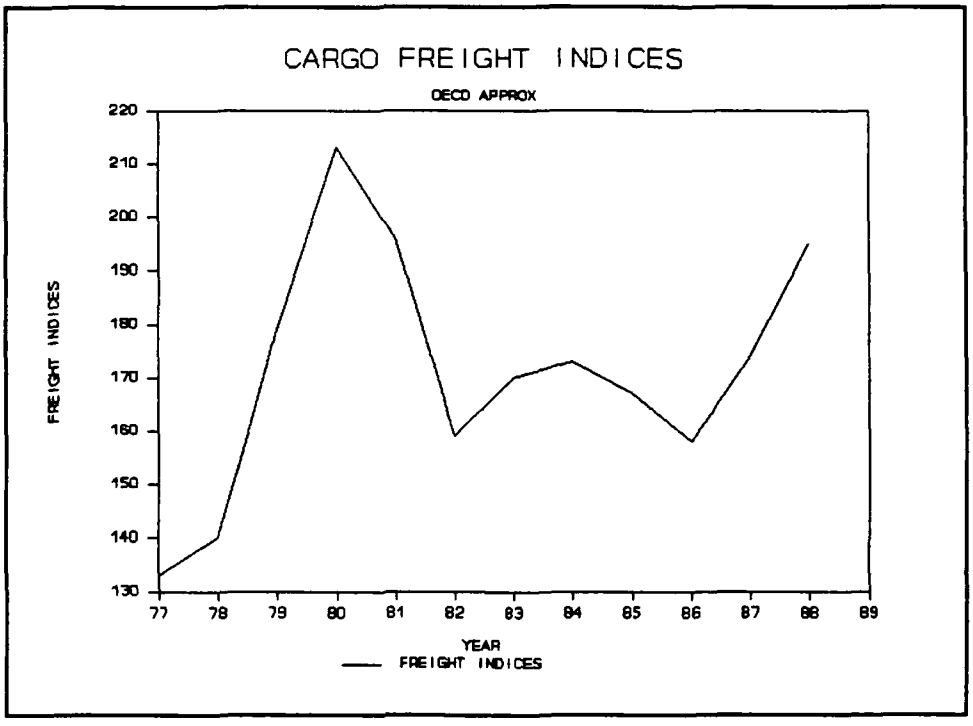


Figure 3. Cargo Freight Indices [Refs. 21,28]

Figure 3 demonstrates the change that occurred in freight rates during the time period under examination and can be matched to the change that occurred in the second-hand price

of cargo ships shown in Figure 4. It is easily determined that freight rates have a substantial impact on the values of ships.

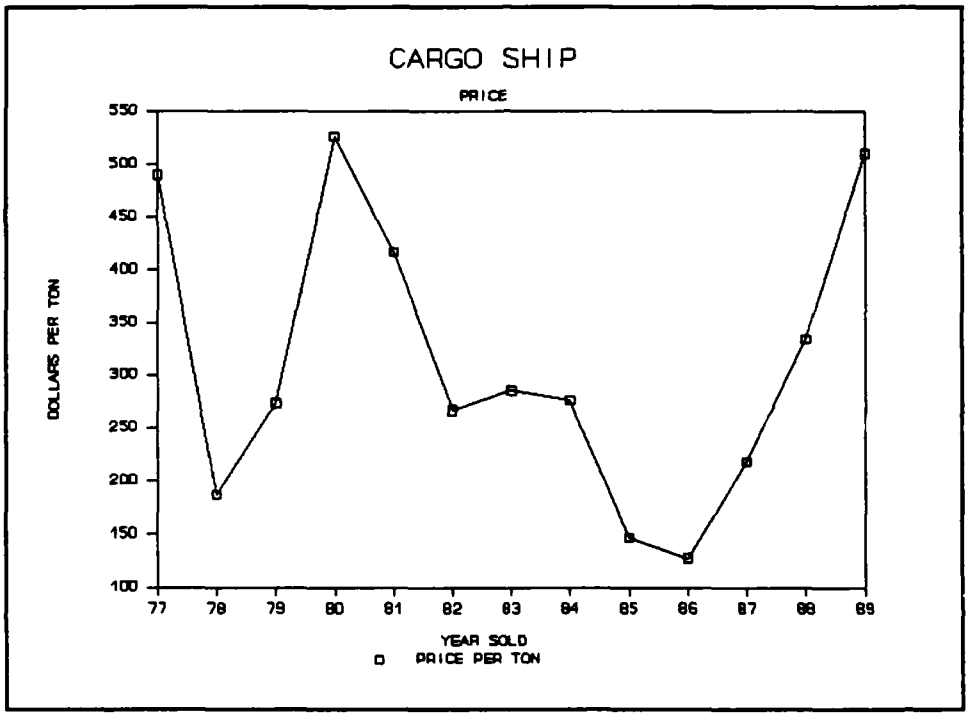


Figure 4. Cargo Ship

When available tonnage increases without a proportional increase in seaborne trade, then a situation of over-supply exists which forces freight rates down which in turn increases ships sold for scrap and decreases new ship construction orders.

In 1977, a 10% increase in growth of OECD industrial output from 1976 resulted in world seaborne trade increase by

approximately 8% leading to the relatively high price of used ships during that time period. [Ref. 12]

By comparing the number of ships that were sent to scrap, a similar explanation can be used. During the extremely depressed ship market of 1982-1986 which was characterized by severely low freight rates brought about by a world economic recession [Refs. 27,28], it was seen that the supply of available tonnage outweighed the demand for shipping services. This over-supply caused low resale values on ships plus high scrap rates. In 1980 only 140 tankers were scrapped compared to 277 in 1985. In the bulker market 20 ships were scrapped in 1980 compared to 385 in 1986. The number of cargo ships scrapped in 1980 was 562 and increased to a high in 1985 of 1063 ships. [Refs. 21,28]

An overtonnage situation for large tankers will exist in the near future if present orders for new VLCC's continue to be placed at the current rate. The number of these large ships totaled 408 at the end of 1988, accounting for 113 million DWT. As of 1989, 20 new ships were launched from shipyards, and, as of March 1990, 67 (22 million DWT) are scheduled to be built with the majority being delivered in 1992. In contrast, only five million DWTs are expected to be scrapped by that time. By 1992 the world VLCC fleet is projected to grow to 130 million DWT without any substantial increase in demand for the transport of crude oil. [Ref. 29]

When the accumulated data were graphed and compared to significant economic indicators such as U.S. long-term interest rates (Figure 5) and specific cargo freight indices (Figure 6), it becomes obvious that as the economy slumps, the values of used ships on the world market is likewise depressed.

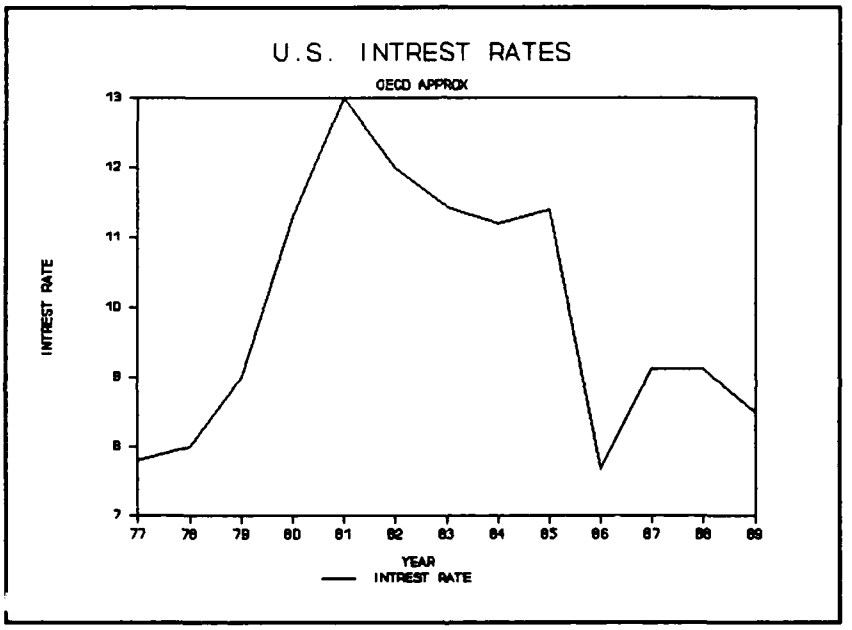


Figure 5. U.S. Interest Rates

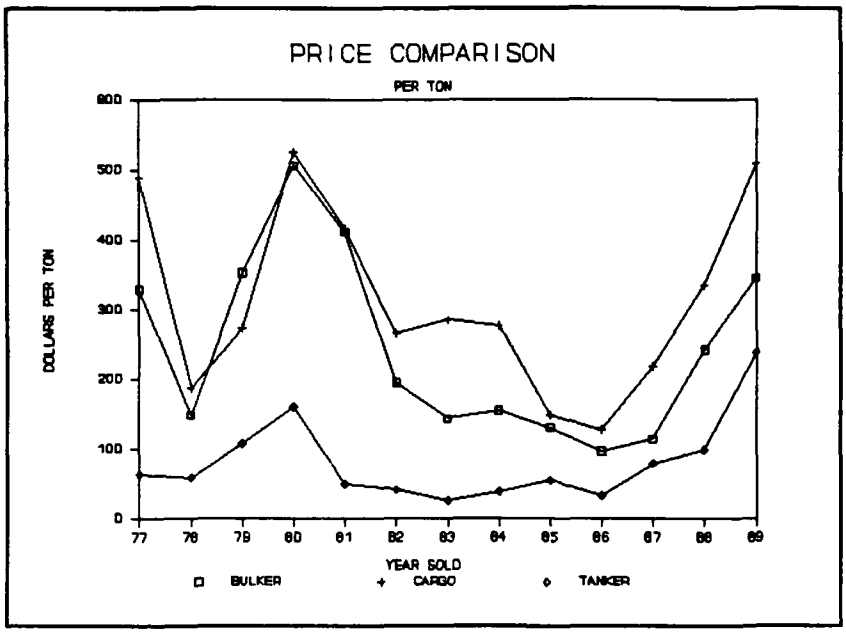


Figure 6. Price Comparison

In analysis of Figures 5 and 6, the data matched this hypothesis until 1986 when interest rates, freight rates and resale cost per ton all increased. After 1986, two major "outside" influences affected the market as can be seen from Figures 7-9. The first is the undercapacity of foreign shipyards to keep up with the demand of new construction orders. As of March 1990, Japanese shipyards have a backlog of 275 vessels waiting to be built. This unexpectedly high demand for new tonnage has caused an increase in demand for existing tonnage. This new demand has driven up prices, and, at the same time, shipowners have retained ships that would normally be considered not economically competitive.

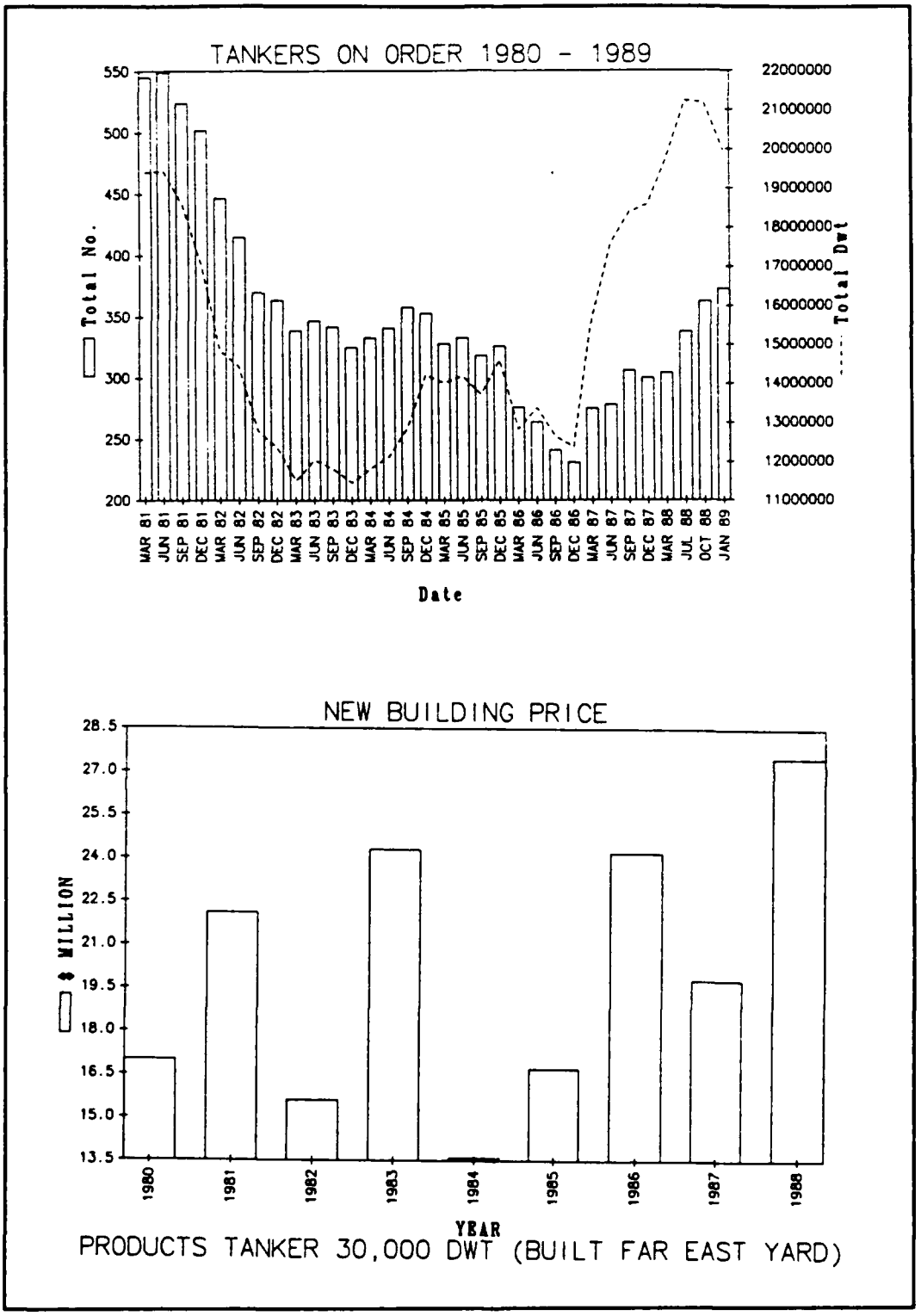


Figure 7. Tankers [Ref. 4]

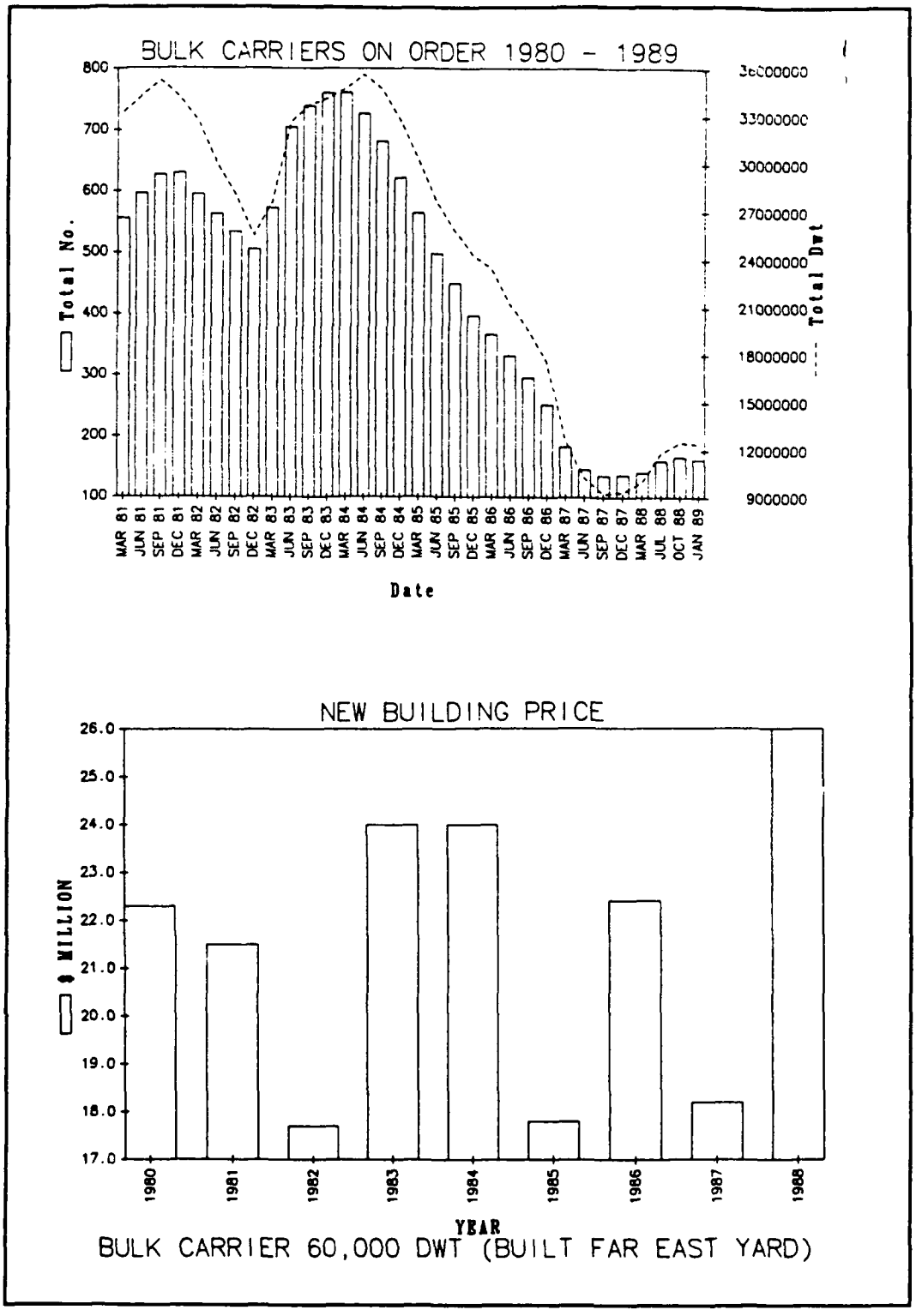


Figure 8. Bulker [Ref. 4]

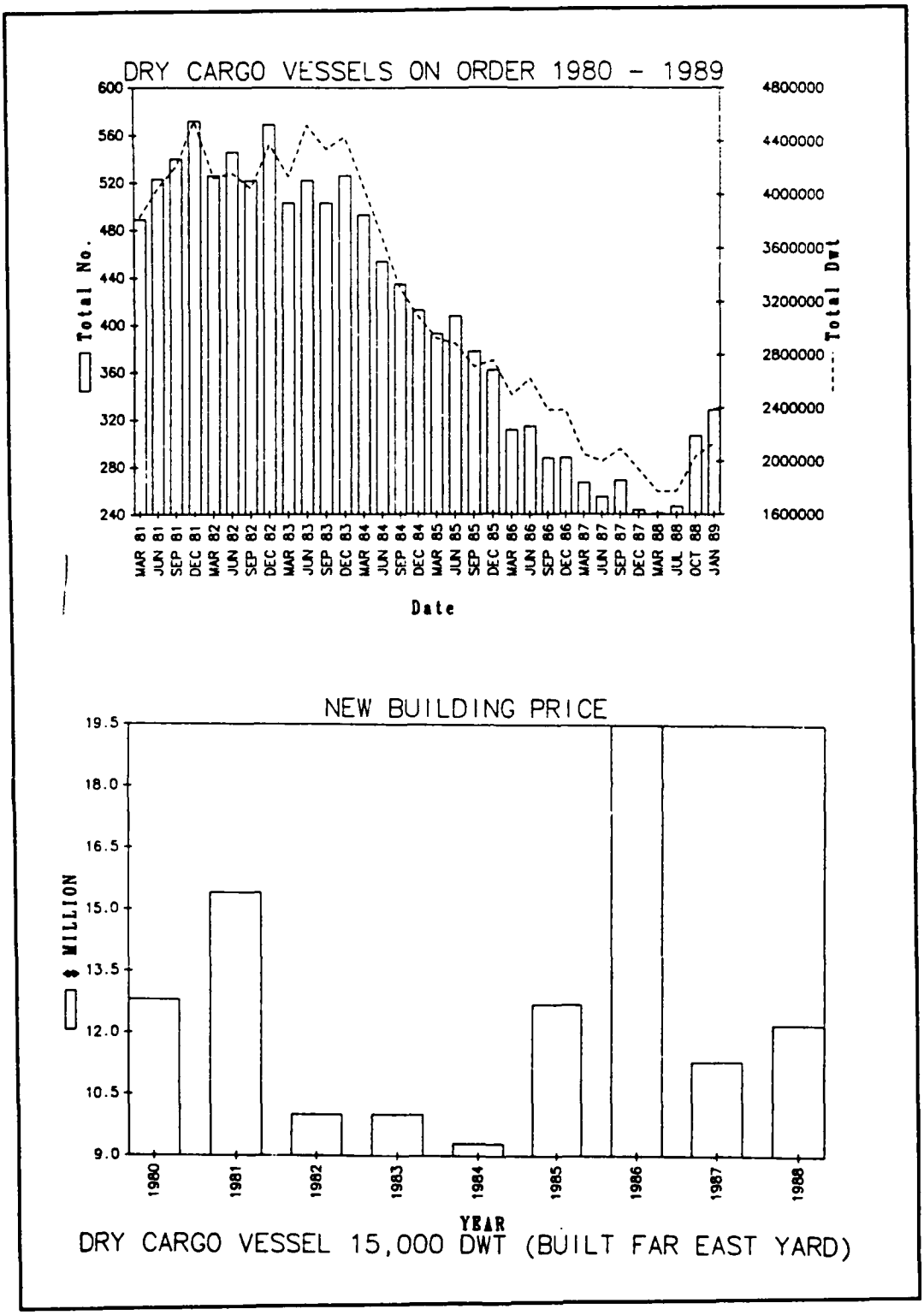


Figure 9. Cargo Ships [Ref. 4]

The second "outside" influence is considered somewhat of an anomaly; the rapid escalation in prices for "used" ships has created a speculative market environment. Because present new construction costs, used bulker prices and used tanker prices are extremely high (Figures 7 and 8), ship buyers are spending enormous amounts of money (Table IV) on used ships hoping that conditions in the economy remain constant and the demand for new ship construction surpasses present shipyard capability. [Ref. 30]

By observation of accumulated data, the shipping industry operates in a cyclical environment. Once the construction boom catches up with the present demand or the demand for shipping services themselves diminish, prices for existing hulls will once again bottom out.

V. STATISTICAL ANALYSIS

A. MODEL

If resources were made available to MSC or MARAD to acquire "new" assets, when would be the right time to buy? Ship resale values fluctuate often, so it is to the prospective buyer's benefit to know the most economical time to buy. In commercial applications the time to buy would be defined as a point during a relatively low cost situation prior to an upswing in the world economy. From a governmental standpoint, the approach would be to purchase at the lowest point possible.

By establishing and quantifying relationships and dependencies between variables, it is possible to predict or estimate the desired variable (ship price) based on a known or predicted value of one or more related values. The variables whose value one is trying to determine is called the dependent variable. The variables which "cause" the values of the dependent variable are called independent variables. [Ref. 31]

In linear regression the dependent variable is referred to as Y, and the independent variables are referred to as X. By performing the regression analysis it is possible to find the constants and correlating factors that define the relationship between the variables. Linear regression will also provide

the means to measure the strength and validity of a relationship among variables. [Ref. 31]

Excluding all direct politically-induced influences on ship resale values, six variables were chosen to forecast future trends in this market. These variables were accumulated for each separate type of vessel during the year that it was sold. Using the 760 ships that were sampled to describe trends, new data (freight rates, total fleet size, fleet age, and trade volume) were accumulated and compared in order to demonstrate if they would have any substantial effect on predicting prices.

These variables were then, via a regression equation, used to determine the "best" indicators or fit for a predictor model.

The following equation was used:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$$

where:

Y = Ship price

X_1 = Ship size (DWT)

X_2 = Ship age at time of sale

X_3 = Average freight rate

X_4 = Total fleet size

X_5 = Fleet age

X_8 = Trade volume

b_i = Coefficients to be determined.

B. DATA

The data that were utilized to form the dependent and independent variables were taken from numerous sources. The individual tonnage, age, and ship prices were accumulated from the "Sales and Purchase" section of the weekly international shipping periodical Fairplay. These data were accumulated randomly by selecting 20 ships a year in the bulker, cargo, and tanker markets from 1977 to 1989 for a total of 260 ships in each type. The tonnage measurements for the regression model were measured in DWT to maintain consistency across ship types.

The remaining independent data were taken from yearly OECD Maritime Transport reports. The freight rates, total fleet size, trade volume, and fleet age were all accumulated for each separate type and year of ship. The freight rates were derived from indices that indicate prices shippers paid to move cargo by ocean transport. Total fleet size is a worldwide accumulation of existing ships by deadweight tonnage consisting of those in operational and laid-up status for each ship type. Trade volume moved is the amount of recorded OECD cargo transported in a given year for each ship type. Fleet age is an average age of existing ships in a given year for each class; vessels older than 30 years in age were considered

as "aged" 35 years. The data for freight rates and trade volume for cargo ships and bulkers were the same in each year due to both being classified as dry cargo.

C. RESULTS

1. R-squared

The R-squared measure is the degree to which the equation fits the prediction model. The closer R-squared is to one, the better the model, or in other words, (1 - R-squared) is the "unexplained" variation of the actual Y values from the values estimated by the regression equation. [Ref. 32] By regressing all independent variables together it is possible to establish a fairly accurate prediction of future ship prices.

Table VI illustrates the accuracy of the model when utilizing the various portions of the equation. The R-squared values of .703, .600 and .536 are given when all variables are employed for each of the individual ships, with the bulker having the best fit. However, it is also easily established that individual variables regressed alone on ship prices are inadequate and using only a portion of the full equation degraded the value of R-squared when compared to the full model.

TABLE VI

REGRESSOR VARIABLES R SQUARED

VARIABLES	BULKER	CARGO	TANKER
ALL VARIABLES	0.703	0.600	0.536
ALL LESS VOLUME	0.697	0.585	0.495
DWT AND AGE	0.388	0.309	0.303
SHIP SIZE	0.151	0.069	0.026
AGE	0.219	0.237	0.303
FREIGHT RATE	0.180	0.058	0.054
FLEET SIZE	0.063	0.026	0.006
FLEET AGE	0.013	0.014	0.001
TRADE VOLUME	0.000	0.037	0.075

The resale prices for all three types of ships responded highest to the variables of; DWT of the individual ships, freight rates and fleet size. However, in contrast to the tanker and cargo ship second hand prices, the bulker prices did not respond to the amount of tonnage moved by bulkers and had little to no bearing on what the ships sold for.

The cargo ships and tankers demonstrated a reaction in the area of age of the individual ship being sold. Total fleet size was not as much of a controlling factor compared to total tonnage moved for the tanker market. Also, size of the

individual cargo ship or tanker made only a moderate contribution to the fit of the overall equation.

2. Coefficients

Tables VII and VIII provide the coefficients and the standard errors of the coefficients for nine separate possibilities of the model. The negative coefficient signs for age (b_2) and fleet size (b_5) logically indicate that as individual ship increased in age, its relative worth decreased, and, as more tonnage (b_5) became available, the demand for ships would decrease. It was interesting to note that in several areas this expectation was found to be incorrect.

3. T-statistic

To test to see if the variable truly added any benefit to the prediction model, a test is used to verify: (1) that the relationship between each independent variable and the dependent variable is logical; and (2) each independent variable coefficient is statistically different from zero.

TABLE VII

COEFFICIENTS AND STANDARD ERRORS
OF THE COEFFICIENTS (TANKER)

TANKERS COEFFICIENTS ARE UPPER NUMBERS
STANDARD ERROR OF THE COEF. ARE THE LOWER NUMBERS

	DWT b1	AGE b2	RATE b3	FLEET SIZE b4	FLEET AGE b5	TRADE VOL. b6
ALL	0.000006	-0.777430	-0.053420	0.017095	2.761721	0.015978
	0.000002	0.061066	0.038683	0.015844	0.594138	0.004052
ALL - VOLUME	0.000007	-0.762260	0.103254	0.049199	3.306743	
	0.000002	0.061934	0.017112	0.014186	0.574137	
AGE AND DWT	0.000001	-0.726430				
	0.000003	0.071874				
SHIP SIZE	0.000009					
	0.000003					
AGE		-0.732400				
		0.069140				
FREIGHT RATE			0.074464			
			0.020224			
FLEET SIZE				0.001182		
				0.009593		
FLEET AGE					-0.134910	
					0.370494	
TRADE VOLUME						0.007307
						0.001742

To test whether the coefficient of each independent variable is significantly different than zero, a hypothesis of the opposite is used (that each is not significantly different from zero, the null hypothesis, Ho: true value of $b_1 = 0$). A t-statistic is utilized to test the hypothesis that the true population coefficient is zero and the sample coefficient is different only due to sampling error. The t-statistic is found by dividing the variable coefficient by its standard error. [Ref. 32]

For example, the tanker t-statistic for DWT in the full model = .000006/.000002 = 3. This indicates that if the true population coefficient was really zero, the result would

be three standard deviations from zero, and the probability of this occurring is almost zero. The hypothesis is rejected and the sample coefficient is accepted. A general rule is: If the absolute value of each t-statistic is two or greater, the null hypothesis is rejected and the sample coefficient is accepted. [Ref. 32]

The ultimate objective of the t-statistic is to obtain the best set of coefficients (variables) to use in the prediction model. Tables VII and VIII reveal that the values of coefficients change as the equation is changed. When the general rule is applied to Table VII for the full model, the variable b_3 (rate) does not meet the necessary criterion; however, if b_3 is taken out of the full model, R-squared lowers from .536 to .532, indicating that the variable b_3 does add slightly to the overall R-squared value. This can be attributed to a possible correlation between freight rates and trade volume moved. In analysis of the results from Table VI (R-squared) and Tables VII and VIII (Coefficients), it is seen that a fairly accurate prediction model of second-hand ship values is possible when utilizing all six variables. However, as more variables are withdrawn from the equation, the prediction value is diminished.

One problem that exists with this analysis of the data is the data itself. By grouping all the bulkers, general cargo, and tankers together, the data failed to take into account that the price of a ship in a specific category will

TABLE VIII

COEFFICIENTS AND STANDARD ERRORS
OF THE COEFFICIENTS (BULKER)

BULKER	COEFFICIENTS ARE UPPER NUMBERS STANDARD ERROR OF THE COEF. ARE THE LOWER NUMBERS					
	DWT b1	AGE b2	RATE b3	FLEET SIZE b4	FLEET AGE b5	TRADE VOL. b6
ALL	0.000051 0.000005	-0.499220 0.038707	0.048885 0.018907	-0.180180 0.038360	1.835900 0.614911	0.010016 0.005003
ALL - VOLUME	0.000054 0.000004	-0.489930 0.037302	0.083450 0.008909	-0.117330 0.020452	1.490255 0.563225	
AGE AND DWT	0.000051 0.000006	-0.490580 0.049131				
SHIP SIZE	0.000048 0.000007					
AGE		-0.470280 0.055345				
FREIGHT RATE			0.084256 0.011676			
FLEET SIZE				-0.056096 0.012718		
FLEET AGE					-0.579610 0.332765	
TRADE VOLUME						0.000028 0.002173

differ tremendously by the type of cargo handling equipment that is installed. A geared bulker is going to bring a higher price than one without gear or an O\B\O bulker versus a simple dry bulker. This is also true in the tanker and cargo ships; the data did not differentiate reefer capable cargo ships or chemical tankers from the generic ship design. Another discrepancy that was not taken into account was the actual condition of the ships themselves at the time of sale.

Obviously, a well-maintained ship is going to bring a higher price than a ship that is ready for scrap.

By utilizing the six variables, however, it is still possible to establish an equation that will deliver an adequate prediction model. Unfortunately, to use such a model necessitates that the potential purchaser must have or be able to predict accurately the data for the regression equation's independent variables.

TABLE IX

COEFFICIENTS AND STANDARD ERRORS OF THE COEFFICIENTS (CARGO)

COEFFICIENTS ARE UPPER NUMBERS
STANDARD ERROR OF THE COEF. ARE THE LOWER NUMBERS

	DWT b1	AGE b2	RATE b3	FLEET SIZE b4	FLEET AGE b5	TRADE VOL. b6
ALL	0.000070	-0.256610	0.042271	-0.014300	-0.094640	-0.005350
	0.000012	0.018784	0.004706	0.030408	0.553191	0.001974
ALL - VOLUME	0.000075	-0.253770	0.038233	-0.093310	1.111918	
	0.000012	0.018464	0.004058	0.010775	0.345234	
AGE AND DWT	0.000088	-0.235380				
	0.000017	0.024937				
SHIP SIZE	0.000086					
	0.000019					
AGE		-0.233870				
		0.026150				
FREIGHT RATE			0.020198			
			0.005261			
FLEET SIZE				-0.033860		
				0.013517		
FLEET AGE					0.900091	
					0.485745	
TRADE VOLUME						-0.002550
						0.000882

VI. CONCLUSION

Due to the United States' inability to revitalize the maritime industry to a point that meets the defense requirements, alternative solutions should be investigated. One viable option would be to purchase these assets on the "used" international market during or prior to a national emergency. Because the U.S. government already has an acquisition system in force to purchase used ships in this arena, the same process can be utilized to acquire emergency sealift at an accelerated pace.

An analysis of accumulated data of used ship prices reveals a direct correlation to individual ship size, individual age, freight rates, fleet size, fleet age, and tonnage moved. Other factors that directly affect these prices are the present economic prosperity of the world and the cost of new construction.

It can also be concluded that ship operators see a vessel as a considerable capital investment and to borrow large amounts of money for new ship construction during times of high interest rates is not seen as a financially sound business strategy when cheaper "used" sources of transportation are available. By comparing leading industrial nations' long-term interest rates to used ship prices it was found that initially, as interest prices rose, so, too, did the resale

values for ships. The downturn in the world economy and the relative rise in new construction prices initially accounts for owner's decisions to purchase the cheaper used ships. As economic hardship continues, prospective buyers purchase neither new or used ships, thus demonstrating periods of low resale values.

The demand for used ships also reflects future expectations of ship prices. As new building prices accelerate, combined with reduced shipbuilding capacity, present and future owners purchase ships in a speculative manner. If new construction cost are forecasted to be high, present prices of tonnage in the used market will remain high.

Effects that are not economic and cannot be forecasted always exist. When the Suez Canal was closed, a major portion of the world's oil had to be transported longer distances mandating the need for extra tonnage in the tanker trade. This type of political pressure on market values makes it difficult to forecast the best time to purchase used ships. In the event of a major conflict, it is certain that the cost to purchase existing tonnage would be expensive. However, if the U.S. Government purchased the necessary tonnage it required in the international market during periods of low economic growth, the savings could be many times what it might be during peak periods.

This solution of acquiring strategic sealift on the international market is not the best one and can only be

considered temporary. However, until the U.S. commercial maritime industry is revitalized, the acquisition of used ships remains a viable option.

APPENDIX A

REGRESSIONS

BULKERS

Regression Output: ON ALL VARIABLES

Constant			2.015809			
Std Err of Y Est			2.455519			
R Squared			0.703863			
No. of Observations			220			
Degrees of Freedom			213			
X Coefficient(s)	0.000051	-0.49922	0.048885	-0.18018	1.835900	0.010016
Std Err of Coef.	0.000005	0.038707	0.018907	0.038360	0.614911	0.005003

Regression Output: MINUS TONNAGE MOVED

Constant			4.259520			
Std Err of Y Est			2.432929			
R Squared			0.696760			
No. of Observations			240			
Degrees of Freedom			234			
X Coefficient(s)	0.000054	-0.48993	0.083450	-0.11733	1.490255	
Std Err of Coef.	0.000004	0.037302	0.008909	0.020452	0.563225	

Regression Output: DWT AND AGE AT SALE ONLY

Constant		8.868983
Std Err of Y Est		3.523346
R Squared		0.388132
No. of Observations		260
Degrees of Freedom		257
X Coefficient(s)	0.000051	-0.49058
Std Err of Coef.	0.000006	0.049131

Regression Output: AGE AT TIME OF SALE ONLY

Constant	10.99594
Std Err of Y Est	3.973774
R Squared	0.218660
No. of Observations	260
Degrees of Freedom	258
X Coefficient(s)	-0.47028
Std Err of Coef.	0.055345

Regression Output: DWT ONLY

Constant	3.535390
Std Err of Y Est	4.142853
R Squared	0.150755
No. of Observations	260
Degrees of Freedom	258
X Coefficient(s)	0.000048
Std Err of Coef.	0.000007

Regression Output: FREIGHT INDICES THRU 1988

Constant	-8.94596
Std Err of Y Est	3.968178
R Squared	0.179514
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	0.084256
Std Err of Coef.	0.011676

Regression Output: TOTAL FLEET SIZE THRU 1988

Constant	16.25449
Std Err of Y Est	4.240104
R Squared	0.063211
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	-0.05096
Std Err of Coef.	0.012718

Regression Output: FLEET AGE THRU 1988

Constant	11.16766
Std Err of Y Est	4.353164
R Squared	0.012587
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	-0.57961
Std Err of Coef.	0.332765

Regression Output: TONNAGE MOVED THRU 1987

Constant	5.363060
Std Err of Y Est	4.460249
R Squared	0.000000
No. of Observations	220
Degrees of Freedom	218
X Coefficient(s)	0.000028
Std Err of Coef.	0.002173

CARGO SHIPS

Regression Output: ALL VARIABLES, THRU 1987

Constant	10.61677
Std Err of Y Est	1.180200
R Squared	0.600339
No. of Observations	220
Degrees of Freedom	213
X Coefficient(s)	0.000070 -0.25661 0.042271 -0.01430 -0.09464 -0.00535
Std Err of Coef.	0.000012 0.018784 0.004706 0.030408 0.553191 0.001974

Regression Output: ALL MINUS TONNAGE MOVED, THRU 1988

Constant	-2.56995
Std Err of Y Est	1.197264
R Squared	0.584852
No. of Observations	240
Degrees of Freedom	234
X Coefficient(s)	0.000075 -0.25377 0.038233 -0.09331 1.111918

Std Err of Coef. 0.000012 0.018464 0.004058 0.010775 0.345234

Regression Output: AGE AND DWT ONLY ,THRU 1989

Constant		4.318146
Std Err of Y Est		1.677150
R Squared		0.308610
No. of Observations		260
Degrees of Freedom		257
X Coefficient(s)	0.000088	-0.23538
Std Err of Coef.	0.000017	0.024937

Regression Output: AGE ONLY, THRU 1989

Constant		5.514870
Std Err of Y Est		1.758857
R Squared		0.236645
No. of Observations		260
Degrees of Freedom		258
X Coefficient(s)	-0.23387	
Std Err of Coef.	0.026150	

Regression Output: DWT ONLY

Constant		1.588336
Std Err of Y Est		1.942487
R Squared		0.068931
No. of Observations		260
Degrees of Freedom		258
X Coefficient(s)	0.000086	
Std Err of Coef.	0.000019	

Regression Output: FREIGHT RATE

Constant		-0.86632
Std Err of Y Est		1.787964
R Squared		0.058322
No. of Observations		240
Degrees of Freedom		238
X Coefficient(s)	0.020198	
Std Err of Coef.	0.005261	

Regression Output: TOTAL FLEET SIZE

Constant	8.021674
Std Err of Y Est	1.818681
R Squared	0.025688
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	-0.03386
Std Err of Coef.	0.013517

Regression Output: TONNAGE MOVED

Constant	7.141003
Std Err of Y Est	1.810914
R Squared	0.036942
No. of Observations	220
Degrees of Freedom	218
X Coefficient(s)	-0.00255
Std Err of Coef.	0.000882

Regression Output: AVG FLEET AGE

Constant	-9.92266
Std Err of Y Est	1.829352
R Squared	0.014221
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	0.900091
Std Err of Coef.	0.485745

TANKERS

Regression Output: ALL VARIABLES THRU 1987

Constant	-43.5931
Std Err of Y Est	3.941995
R Squared	0.535732
No. of Observations	220
Degrees of Freedom	213

X Coefficient(s)	0.000006	-0.77743	-0.05342	0.017095	2.761721	0.015978
Std Err of Coef.	0.000002	0.061066	0.038683	0.015844	0.594138	0.004052

Regression Output: ALL VARIABLES MINUS TONNAGE MOVED, THRU 1988

Constant		-42.1069			
Std Err of Y Est		4.100373			
R Squared		0.494996			
No. of Observations		240			
Degrees of Freedom		234			
X Coefficient(s)	0.000007	-0.76226	0.103254	0.049199	3.306743
Std Err of Coef.	0.000002	0.061934	0.017112	0.014186	0.574137

Regression Output: AGE AND DWT ONLY, THRU 1989

Constant		15.75623
Std Err of Y Est		5.095678
R Squared		0.303367
No. of Observations		260
Degrees of Freedom		257
X Coefficient(s)	0.000001	-0.72643
Std Err of Coef.	0.000003	0.071874

Regression Output: AGE ONLY, THRU 1989

Constant		15.94190
Std Err of Y Est		5.086749
R Squared		0.303105
No. of Observations		260
Degrees of Freedom		258
X Coefficient(s)	-0.73240	
Std Err of Coef.	0.069140	

Regression Output: DWT ONLY

Constant		6.998078
Std Err of Y Est		6.012173
R Squared		0.026469
No. of Observations		260
Degrees of Freedom		258
X Coefficient(s)	0.000009	
Std Err of Coef.	0.000003	

Regression Output: FREIGHT RATE ONLY

Constant	3.049198
Std Err of Y Est	5.565018
R Squared	0.053889
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	0.074464
Std Err of Coef.	0.020224

Regression Output: TOTAL FLEET SIZE

Constant	4.044751
Std Err of Y Est	5.703144
R Squared	0.006340
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	0.011822
Std Err of Coef.	0.009593

Regression Output: AVG FLEET AGE

Constant	9.058726
Std Err of Y Est	5.719718
R Squared	0.000556
No. of Observations	240
Degrees of Freedom	238
X Coefficient(s)	-0.13491
Std Err of Coef.	0.370494

Regression Output: TONNAGE MOVED

Constant	-4.92959
Std Err of Y Est	5.501058
R Squared	0.074650
No. of Observations	220
Degrees of Freedom	218
X Coefficient(s)	0.007307
Std Err of Coef.	0.001742

APPENDIX B

SHIP DATA

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
77	BULKER	$4.60	26610	12	133	174.4	8.1	1515
77	BULKER	$1.00	15633	17	133	174.4	8.1	1515
77	BULKER	$8.90	22363	15	133	174.4	8.1	1515
77	BULKER	$13.50	50900	1	133	174.4	8.1	1515
77	BULKER	$8.60	26976	4	133	174.4	8.1	1515
77	BULKER	$8.00	51299	8	133	174.4	8.1	1515
77	BULKER	$2.20	19676	15	133	174.4	8.1	1515
77	BULKER	$4.60	16765	8	133	174.4	8.1	1515
77	BULKER	$3.30	15933	17	133	174.4	8.1	1515
77	BULKER	$3.50	18162	6	133	174.4	8.1	1515
77	BULKER	$6.25	25894	3	133	174.4	8.1	1515
77	BULKER	$5.20	25531	10	133	174.4	8.1	1515
77	BULKER	$6.00	26844	9	133	174.4	8.1	1515
77	BULKER	$4.20	30593	9	133	174.4	8.1	1515
77	BULKER	$2.50	16848	15	133	174.4	8.1	1515
77	BULKER	$3.50	16992	8	133	174.4	8.1	1515
77	BULKER	$3.15	25028	10	133	174.4	8.1	1515
77	BULKER	$6.00	33151	5	133	174.4	8.1	1515
77	BULKER	$5.45	24016	4	133	174.4	8.1	1515
77	BULKER	$4.85	37238	9	133	174.4	8.1	1515
78	BULKER	$2.80	49473	11	140	184.5	8.5	1602
78	BULKER	$3.40	12198	3	140	184.5	8.5	1602
78	BULKER	$3.50	46810	12	140	184.5	8.5	1602
78	BULKER	$5.80	31775	3	140	184.5	8.5	1602
78	BULKER	$3.60	51750	11	140	184.5	8.5	1602
78	BULKER	$4.40	26000	3	140	184.5	8.5	1602
78	BULKER	$2.00	49473	11	140	184.5	8.5	1602
78	BULKER	$0.80	24410	17	140	184.5	8.5	1602
78	BULKER	$13.20	60857	1	140	184.5	8.5	1602
78	BULKER	$3.90	32312	7	140	184.5	8.5	1602
78	BULKER	$1.70	16087	12	140	184.5	8.5	1602
78	BULKER	$1.55	31786	15	140	184.5	8.5	1602
78	BULKER	$0.94	52156	16	140	184.5	8.5	1602
78	BULKER	$2.00	16272	10	140	184.5	8.5	1602
78	BULKER	$6.00	92832	6	140	184.5	8.5	1602
78	BULKER	$2.60	19536	10	140	184.5	8.5	1602
78	BULKER	$4.60	137519	6	140	184.5	8.5	1602

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
78	BULKER	$1.20	16143	16	140	184.5	8.5	1602
78	BULKER	$2.50	25379	12	140	184.5	8.5	1602
78	BULKER	$2.40	38356	11	140	184.5	8.5	1602
79	BULKER	$2.10	23115	18	179	188.5	8.9	1731
79	BULKER	$1.35	16866	16	179	188.5	8.9	1731
79	BULKER	$3.50	21479	11	179	188.5	8.9	1731
79	BULKER	$8.00	38252	3	179	188.5	8.9	1731
79	BULKER	$10.90	54681	5	179	188.5	8.9	1731
79	BULKER	$8.90	65798	11	179	188.5	8.9	1731
79	BULKER	$6.25	35855	9	179	188.5	8.9	1731
79	BULKER	$3.05	18441	12	179	188.5	8.9	1731
79	BULKER	$12.75	70818	3	179	188.5	8.9	1731
79	BULKER	$6.30	25635	8	179	188.5	8.9	1731
79	BULKER	$4.70	29492	14	179	188.5	8.9	1731
79	BULKER	$3.30	16711	11	179	188.5	8.9	1731
79	BULKER	$4.77	21516	8	179	188.5	8.9	1731
79	BULKER	$10.50	61565	5	179	188.5	8.9	1731
79	BULKER	$11.00	27947	3	179	188.5	8.9	1731
79	BULKER	$8.20	29648	6	179	188.5	8.9	1731
79	BULKER	$3.75	21134	11	179	188.5	8.9	1731
79	BULKER	$4.00	21175	11	179	188.5	8.9	1731
79	BULKER	$11.20	34583	7	179	188.5	8.9	1731
79	BULKER	$10.50	29595	2	179	188.5	8.9	1731
80	BULKER	$6.00	22135	11	213	191.0	9.3	1833
80	BULKER	$6.30	38904	14	213	191.0	9.3	1833
80	BULKER	$16.75	36071	2	213	191.0	9.3	1833
80	BULKER	$20.30	60866	3	213	191.0	9.3	1833
80	BULKER	$11.80	30910	6	213	191.0	9.3	1833
80	BULKER	$5.50	23484	13	213	191.0	9.3	1833
80	BULKER	$8.75	46545	13	213	191.0	9.3	1833
80	BULKER	$15.50	36999	4	213	191.0	9.3	1833
80	BULKER	$10.00	27500	3	213	191.0	9.3	1833
80	BULKER	$8.50	25299	3	213	191.0	9.3	1833
80	BULKER	$4.00	18009	15	213	191.0	9.3	1833
80	BULKER	$11.90	27307	3	213	191.0	9.3	1833
80	BULKER	$5.50	24564	15	213	191.0	9.3	1833
80	BULKER	$12.50	38264	9	213	191.0	9.3	1833
80	BULKER	$9.50	50789	13	213	191.0	9.3	1833
80	BULKER	$16.50	69889	8	213	191.0	9.3	1833
80	BULKER	$6.50	17002	6	213	191.0	9.3	1833
80	BULKER	$18.00	66098	7	213	191.0	9.3	1833
80	BULKER	$8.25	35040	12	213	191.0	9.3	1833
80	BULKER	$5.40	26299	16	213	191.0	9.3	1833

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
81	BULKER	$8.60	19408	14	196	199.5	9.7	1866
81	BULKER	$13.50	69613	13	196	199.5	9.7	1866
81	BULKER	$7.60	28515	14	196	199.5	9.7	1866
81	BULKER	$13.10	34575	9	196	199.5	9.7	1866
81	BULKER	$19.00	34683	2	196	199.5	9.7	1866
81	BULKER	$5.70	19876	11	196	199.5	9.7	1866
81	BULKER	$4.50	29242	20	196	199.5	9.7	1866
81	BULKER	$23.80	118440	8	196	199.5	9.7	1866
81	BULKER	$5.60	36592	16	196	199.5	9.7	1866
81	BULKER	$6.60	11110	5	196	199.5	9.7	1866
81	BULKER	$9.20	80877	14	196	199.5	9.7	1866
81	BULKER	$30.00	127050	5	196	199.5	9.7	1866
81	BULKER	$9.50	25651	10	196	199.5	9.7	1866
81	BULKER	$7.50	21916	8	196	199.5	9.7	1866
81	BULKER	$9.20	80877	14	196	199.5	9.7	1866
81	BULKER	$5.00	37468	15	196	199.5	9.7	1866
81	BULKER	$7.50	36569	16	196	199.5	9.7	1866
81	BULKER	$4.50	32168	18	196	199.5	9.7	1866
81	BULKER	$11.00	53209	10	196	199.5	9.7	1866
81	BULKER	$6.40	27484	13	196	199.5	9.7	1866
82	BULKER	$4.55	77727	14	159	211.2	10.3	1793
82	BULKER	$6.60	17715	5	159	211.2	10.3	1793
82	BULKER	$4.50	100124	15	159	211.2	10.3	1793
82	BULKER	$2.60	35751	17	159	211.2	10.3	1793
82	BULKER	$11.00	27299	8	159	211.2	10.3	1793
82	BULKER	$2.30	47561	16	159	211.2	10.3	1793
82	BULKER	$1.50	39013	15	159	211.2	10.3	1793
82	BULKER	$3.80	18634	12	159	211.2	10.3	1793
82	BULKER	$6.45	51300	10	159	211.2	10.3	1793
82	BULKER	$7.40	110342	11	159	211.2	10.3	1793
82	BULKER	$7.75	26922	7	159	211.2	10.3	1793
82	BULKER	$11.60	40524	6	159	211.2	10.3	1793
82	BULKER	$1.20	15741	20	159	211.2	10.3	1793
82	BULKER	$1.50	23973	13	159	211.2	10.3	1793
82	BULKER	$2.00	55466	14	159	211.2	10.3	1793
82	BULKER	$2.60	17351	12	159	211.2	10.3	1793
82	BULKER	$4.90	26041	10	159	211.2	10.3	1793
82	BULKER	$0.83	26299	10	159	211.2	10.3	1793
82	BULKER	$3.00	17032	8	159	211.2	10.3	1793
82	BULKER	$3.00	20446	13	159	211.2	10.3	1793
83	BULKER	$3.60	22625	11	170	220.6	10.5	1770
83	BULKER	$2.70	30643	11	170	220.6	10.5	1770
83	BULKER	$1.60	37190	10	170	220.6	10.5	1770
83	BULKER	$4.25	183570	11	170	220.6	10.5	1770

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
83	BULKER	$0.75	43812	16	170	220.6	10.5	1770
83	BULKER	$2.10	108649	15	170	220.6	10.5	1770
83	BULKER	$1.25	16876	18	170	220.6	10.5	1770
83	BULKER	$7.20	71600	7	170	220.6	10.5	1770
83	BULKER	$2.10	37088	16	170	220.6	10.5	1770
83	BULKER	$4.95	26246	11	170	220.6	10.5	1770
83	BULKER	$4.50	23222	10	170	220.6	10.5	1770
83	BULKER	$7.60	26931	7	170	220.6	10.5	1770
83	BULKER	$9.50	35164	6	170	220.6	10.5	1770
83	BULKER	$1.70	15147	12	170	220.6	10.5	1770
83	BULKER	$3.00	16895	11	170	220.6	10.5	1770
83	BULKER	$3.90	54681	9	170	220.6	10.5	1770
83	BULKER	$6.00	78138	10	170	220.6	10.5	1770
83	BULKER	$1.15	38261	18	170	220.6	10.5	1770
83	BULKER	$7.80	43112	7	170	220.6	10.5	1770
83	BULKER	$1.20	30436	20	170	220.6	10.5	1770
84	BULKER	$4.20	29902	9	173	228.6	10.5	1912
84	BULKER	$1.25	31328	20	173	228.6	10.5	1912
84	BULKER	$2.00	15917	12	173	228.6	10.5	1912
84	BULKER	$4.50	34201	12	173	228.6	10.5	1912
84	BULKER	$2.00	17351	14	173	228.6	10.5	1912
84	BULKER	$13.25	118455	7	173	228.6	10.5	1912
84	BULKER	$2.65	75436	16	173	228.6	10.5	1912
84	BULKER	$6.00	29300	7	173	228.6	10.5	1912
84	BULKER	$4.35	72789	13	173	228.6	10.5	1912
84	BULKER	$8.50	122544	12	173	228.6	10.5	1912
84	BULKER	$9.30	104850	10	173	228.6	10.5	1912
84	BULKER	$0.92	19408	17	173	228.6	10.5	1912
84	BULKER	$0.63	24378	20	173	228.6	10.5	1912
84	BULKER	$10.50	63000	6	173	228.6	10.5	1912
84	BULKER	$3.50	57580	16	173	228.6	10.5	1912
84	BULKER	$0.60	16659	16	173	228.6	10.5	1912
84	BULKER	$3.00	41261	14	173	228.6	10.5	1912
84	BULKER	$2.50	74832	17	173	228.6	10.5	1912
84	BULKER	$3.90	22670	7	173	228.6	10.5	1912
84	BULKER	$5.35	61767	11	173	228.6	10.5	1912
85	BULKER	$7.00	61398	11	167	237.3	10.2	1923
85	BULKER	$2.43	76559	17	167	237.3	10.2	1923
85	BULKER	$0.70	12000	15	167	237.3	10.2	1923
85	BULKER	$2.95	27232	12	167	237.3	10.2	1923
85	BULKER	$10.00	122750	9	167	237.3	10.2	1923
85	BULKER	$2.30	26901	10	167	237.3	10.2	1923
85	BULKER	$0.88	19672	15	167	237.3	10.2	1923
85	BULKER	$2.75	22670	8	167	237.3	10.2	1923

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
85	BULKER	$1.15	9262	5	167	237.3	10.2	1923
85	BULKER	$1.65	28420	14	167	237.3	10.2	1923
85	BULKER	$1.20	12005	10	167	237.3	10.2	1923
85	BULKER	$4.70	64473	7	167	237.3	10.2	1923
85	BULKER	$1.25	51714	17	167	237.3	10.2	1923
85	BULKER	$1.25	24353	14	167	237.3	10.2	1923
85	BULKER	$1.75	29623	10	167	237.3	10.2	1923
85	BULKER	$1.00	23222	12	167	237.3	10.2	1923
85	BULKER	$6.50	37609	1	167	237.3	10.2	1923
85	BULKER	$0.88	26646	14	167	237.3	10.2	1923
85	BULKER	$1.60	30952	11	167	237.3	10.2	1923
85	BULKER	$1.55	23151	8	167	237.3	10.2	1923
86	BULKER	$2.50	52327	12	158	235.2	10.2	1945
86	BULKER	$2.70	43112	9	158	235.2	10.2	1945
86	BULKER	$1.39	28347	10	158	235.2	10.2	1945
86	BULKER	$10.00	122050	11	158	235.2	10.2	1945
86	BULKER	$3.00	87203	15	158	235.2	10.2	1945
86	BULKER	$4.10	73172	9	158	235.2	10.2	1945
86	BULKER	$1.20	26702	11	158	235.2	10.2	1945
86	BULKER	$2.70	60920	11	158	235.2	10.2	1945
86	BULKER	$1.90	37517	10	158	235.2	10.2	1945
86	BULKER	$6.50	62343	4	158	235.2	10.2	1945
86	BULKER	$1.75	35215	10	158	235.2	10.2	1945
86	BULKER	$3.90	29192	2	158	235.2	10.2	1945
86	BULKER	$0.88	26246	14	158	235.2	10.2	1945
86	BULKER	$1.40	30797	12	158	235.2	10.2	1945
86	BULKER	$3.10	165021	15	158	235.2	10.2	1945
86	BULKER	$5.85	129882	10	158	235.2	10.2	1945
86	BULKER	$0.90	26543	14	158	235.2	10.2	1945
86	BULKER	$2.00	21310	5	158	235.2	10.2	1945
86	BULKER	$1.90	21288	4	158	235.2	10.2	1945
86	BULKER	$1.00	35308	14	158	235.2	10.2	1945
87	BULKER	$4.50	169623	14	174	231.8	10.4	1975
87	BULKER	$4.20	103332	16	174	231.8	10.4	1975
87	BULKER	$7.50	64698	6	174	231.8	10.4	1975
87	BULKER	$3.30	85414	15	174	231.8	10.4	1975
87	BULKER	$5.70	69165	9	174	231.8	10.4	1975
87	BULKER	$3.00	36254	10	174	231.8	10.4	1975
87	BULKER	$3.50	34541	11	174	231.8	10.4	1975
87	BULKER	$4.10	104749	15	174	231.8	10.4	1975
87	BULKER	$1.30	47392	19	174	231.8	10.4	1975
87	BULKER	$1.80	18750	8	174	231.8	10.4	1975
87	BULKER	$1.25	20722	17	174	231.8	10.4	1975
87	BULKER	$1.83	61473	16	174	231.8	10.4	1975

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
87	BULKER	$7.50	217257	15	174	231.8	10.4	1975
87	BULKER	$7.00	103729	13	174	231.8	10.4	1975
87	BULKER	$3.25	55069	14	174	231.8	10.4	1975
87	BULKER	$6.25	119696	15	174	231.8	10.4	1975
87	BULKER	$4.45	26814	7	174	231.8	10.4	1975
87	BULKER	$3.50	28003	13	174	231.8	10.4	1975
87	BULKER	$7.30	145207	14	174	231.8	10.4	1975
87	BULKER	$18.50	134806	5	174	231.8	10.4	1975
88	BULKER	$4.00	26638	14	195	230.1	10.8	
88	BULKER	$5.90	25854	7	195	230.1	10.8	
88	BULKER	$5.10	16008	16	195	230.1	10.8	
88	BULKER	$2.35	30781	18	195	230.1	10.8	
88	BULKER	$8.00	119500	14	195	230.1	10.8	
88	BULKER	$9.20	110906	15	195	230.1	10.8	
88	BULKER	$7.90	145092	17	195	230.1	10.8	
88	BULKER	$11.50	61523	12	195	230.1	10.8	
88	BULKER	$16.20	127050	12	195	230.1	10.8	
88	BULKER	$5.90	23960	8	195	230.1	10.8	
88	BULKER	$4.00	21400	11	195	230.1	10.8	
88	BULKER	$3.50	16866	11	195	230.1	10.8	
88	BULKER	$3.10	25651	17	195	230.1	10.8	
88	BULKER	$5.10	23584	14	195	230.1	10.8	
88	BULKER	$7.00	53294	13	195	230.1	10.8	
88	BULKER	$5.60	24738	11	195	230.1	10.8	
88	BULKER	$2.40	19464	18	195	230.1	10.8	
88	BULKER	$8.50	35343	10	195	230.1	10.8	
88	BULKER	$8.10	37787	8	195	230.1	10.8	
88	BULKER	$4.80	23851	12	195	230.1	10.8	
89	BULKER	$12.00	84141	13				
89	BULKER	$8.10	37628	13				
89	BULKER	$4.00	16583	13				
89	BULKER	$17.00	169521	13				
89	BULKER	$2.70	27248	20				
89	BULKER	$2.50	16979	19				
89	BULKER	$3.60	25957	18				
89	BULKER	$8.50	61604	16				
89	BULKER	$14.00	167696	16				
89	BULKER	$2.40	16992	19				
89	BULKER	$12.50	24784	4				
89	BULKER	$16.30	61930	8				
89	BULKER	$8.00	25317	12				
89	BULKER	$6.50	26641	15				
89	BULKER	$14.80	36202	6				
89	BULKER	$5.50	29020	17				
89	BULKER	$14.00	64064	12				

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
89	BULKER	$10.70	40404	13				
89	BULKER	$8.50	29300	12				
89	BULKER	$4.70	16641	17				
77	CARGO	$2.50	8002	7	133	139.1	13.7	1515
77	CARGO	$2.20	8151	7	133	139.1	13.7	1515
77	CARGO	$5.70	15188	5	133	139.1	13.7	1515
77	CARGO	$2.15	8236	9	133	139.1	13.7	1515
77	CARGO	$4.70	7435	7	133	139.1	13.7	1515
77	CARGO	$2.80	9503	8	133	139.1	13.7	1515
77	CARGO	$1.10	5008	15	133	139.1	13.7	1515
77	CARGO	$4.95	7681	8	133	139.1	13.7	1515
77	CARGO	$1.40	7688	17	133	139.1	13.7	1515
77	CARGO	$4.70	15174	6	133	139.1	13.7	1515
77	CARGO	$6.00	14969	9	133	139.1	13.7	1515
77	CARGO	$6.00	14983	10	133	139.1	13.7	1515
77	CARGO	$4.55	15832	9	133	139.1	13.7	1515
77	CARGO	$5.00	15191	7	133	139.1	13.7	1515
77	CARGO	$2.10	10637	6	133	139.1	13.7	1515
77	CARGO	$4.65	16450	7	133	139.1	13.7	1515
77	CARGO	$4.70	16117	8	133	139.1	13.7	1515
77	CARGO	$3.50	15177	7	133	139.1	13.7	1515
77	CARGO	$3.40	9906	10	133	139.1	13.7	1515
77	CARGO	$1.60	10364	17	133	139.1	13.7	1515
78	CARGO	$1.80	9754	17	140	146.8	13.8	1602
78	CARGO	$2.30	12751	13	140	146.8	13.8	1602
78	CARGO	$0.60	7183	15	140	146.8	13.8	1602
78	CARGO	$5.50	14417	12	140	146.8	13.8	1602
78	CARGO	$1.25	8538	17	140	146.8	13.8	1602
78	CARGO	$0.81	12579	16	140	146.8	13.8	1602
78	CARGO	$1.40	73365	13	140	146.8	13.8	1602
78	CARGO	$1.28	10844	12	140	146.8	13.8	1602
78	CARGO	$1.28	10804	12	140	146.8	13.8	1602
78	CARGO	$1.25	6207	15	140	146.8	13.8	1602
78	CARGO	$5.00	16350	6	140	146.8	13.8	1602
78	CARGO	$3.00	12991	12	140	146.8	13.8	1602
78	CARGO	$1.40	10910	13	140	146.8	13.8	1602
78	CARGO	$1.40	10784	13	140	146.8	13.8	1602
78	CARGO	$1.40	10827	13	140	146.8	13.8	1602
78	CARGO	$0.65	9577	18	140	146.8	13.8	1602
78	CARGO	$0.95	14738	17	140	146.8	13.8	1602
78	CARGO	$2.38	6670	7	140	146.8	13.8	1602
78	CARGO	$2.35	14299	11	140	146.8	13.8	1602
78	CARGO	$2.35	14417	11	140	146.8	13.8	1602

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
79	CARGO	$1.40	10232	19	179	154.7	13.9	1731
79	CARGO	$3.50	13005	10	179	154.7	13.9	1731
79	CARGO	$3.25	8575	12	179	154.7	13.9	1731
79	CARGO	$3.25	8575	12	179	154.7	13.9	1731
79	CARGO	$1.22	12728	16	179	154.7	13.9	1731
79	CARGO	$1.00	8923	16	179	154.7	13.9	1731
79	CARGO	$2.15	12753	12	179	154.7	13.9	1731
79	CARGO	$2.15	12806	12	179	154.7	13.9	1731
79	CARGO	$2.15	12841	12	179	154.7	13.9	1731
79	CARGO	$2.95	15230	11	179	154.7	13.9	1731
79	CARGO	$4.00	15138	6	179	154.7	13.9	1731
79	CARGO	$1.56	15562	19	179	154.7	13.9	1731
79	CARGO	$0.80	5260	17	179	154.7	13.9	1731
79	CARGO	$3.20	15107	5	179	154.7	13.9	1731
79	CARGO	$2.60	16245	10	179	154.7	13.9	1731
79	CARGO	$3.30	16033	11	179	154.7	13.9	1731
79	CARGO	$3.25	12139	9	179	154.7	13.9	1731
79	CARGO	$2.20	14580	15	179	154.7	13.9	1731
79	CARGO	$1.95	14689	16	179	154.7	13.9	1731
79	CARGO	$1.30	12795	18	179	154.7	13.9	1731
80	CARGO	$4.55	15103	9	213	160.1	14.0	1833
80	CARGO	$1.17	15796	19	213	160.1	14.0	1833
80	CARGO	$1.30	10320	19	213	160.1	14.0	1833
80	CARGO	$2.00	6665	14	213	160.1	14.0	1833
80	CARGO	$3.10	15542	13	213	160.1	14.0	1833
80	CARGO	$8.50	16214	4	213	160.1	14.0	1833
80	CARGO	$8.50	17128	4	213	160.1	14.0	1833
80	CARGO	$3.90	15281	11	213	160.1	14.0	1833
80	CARGO	$3.70	8903	4	213	160.1	14.0	1833
80	CARGO	$2.50	9076	10	213	160.1	14.0	1833
80	CARGO	$2.50	11607	13	213	160.1	14.0	1833
80	CARGO	$4.75	16092	10	213	160.1	14.0	1833
80	CARGO	$8.25	15060	2	213	160.1	14.0	1833
80	CARGO	$8.25	15060	2	213	160.1	14.0	1833
80	CARGO	$4.80	15103	9	213	160.1	14.0	1833
80	CARGO	$3.85	12883	11	213	160.1	14.0	1833
80	CARGO	$4.30	15418	11	213	160.1	14.0	1833
80	CARGO	$7.20	20499	9	213	160.1	14.0	1833
80	CARGO	$0.70	4196	13	213	160.1	14.0	1833
80	CARGO	$2.50	4705	10	213	160.1	14.0	1833
81	CARGO	$2.30	14519	20	196	162.2	13.7	1866
81	CARGO	$5.75	15107	7	196	162.2	13.7	1866
81	CARGO	$4.20	11612	6	196	162.2	13.7	1866
81	CARGO	$7.90	15000	5	196	162.2	13.7	1866

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
81	CARGO	$2.50	15783	20	196	162.2	13.7	1866
81	CARGO	$3.30	9377	10	196	162.2	13.7	1866
81	CARGO	$2.60	16230	20	196	162.2	13.7	1866
81	CARGO	$2.70	15815	19	196	162.2	13.7	1866
81	CARGO	$5.20	16261	10	196	162.2	13.7	1866
81	CARGO	$3.90	26435	19	196	162.2	13.7	1866
81	CARGO	$4.35	15154	13	196	162.2	13.7	1866
81	CARGO	$2.10	11157	19	196	162.2	13.7	1866
81	CARGO	$3.30	9937	19	196	162.2	13.7	1866
81	CARGO	$3.30	9937	18	196	162.2	13.7	1866
81	CARGO	$1.80	9094	18	196	162.2	13.7	1866
81	CARGO	$1.10	14184	20	196	162.2	13.7	1866
81	CARGO	$4.00	8299	6	196	162.2	13.7	1866
81	CARGO	$4.00	8299	6	196	162.2	13.7	1866
81	CARGO	$3.85	7849	9	196	162.2	13.7	1866
81	CARGO	$4.70	11000	7	196	162.2	13.7	1866
82	CARGO	$1.95	16816	18	159	165.6	14.2	1793
82	CARGO	$2.40	23521	20	159	165.6	14.2	1793
82	CARGO	$5.85	15166	9	159	165.6	14.2	1793
82	CARGO	$1.60	12544	16	159	165.6	14.2	1793
82	CARGO	$2.60	9857	10	159	165.6	14.2	1793
82	CARGO	$2.00	12710	13	159	165.6	14.2	1793
82	CARGO	$1.60	13733	15	159	165.6	14.2	1793
82	CARGO	$1.10	12703	16	159	165.6	14.2	1793
82	CARGO	$4.00	5525	5	159	165.6	14.2	1793
82	CARGO	$1.50	17000	6	159	165.6	14.2	1793
82	CARGO	$2.50	15022	14	159	165.6	14.2	1793
82	CARGO	$2.50	13228	13	159	165.6	14.2	1793
82	CARGO	$5.00	14899	6	159	165.6	14.2	1793
82	CARGO	$5.00	14899	6	159	165.6	14.2	1793
82	CARGO	$6.90	12466	4	159	165.6	14.2	1793
82	CARGO	$0.75	14196	15	159	165.6	14.2	1793
82	CARGO	$0.75	14196	15	159	165.6	14.2	1793
82	CARGO	$0.80	12468	18	159	165.6	14.2	1793
82	CARGO	$1.30	12102	13	159	165.6	14.2	1793
82	CARGO	$1.15	13723	15	159	165.6	14.2	1793
83	CARGO	$2.30	11723	8	170	167.8	14.3	1770
83	CARGO	$2.30	11049	10	170	167.8	14.3	1770
83	CARGO	$1.20	16382	15	170	167.8	14.3	1770
83	CARGO	$1.30	3171	6	170	167.8	14.3	1770
83	CARGO	$1.30	3171	6	170	167.8	14.3	1770
83	CARGO	$1.75	16000	13	170	167.8	14.3	1770
83	CARGO	$0.40	15838	20	170	167.8	14.3	1770
83	CARGO	$1.55	6174	7	170	167.8	14.3	1770

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
83	CARGO	$1.10	13869	11	170	167.8	14.3	1770
83	CARGO	$1.60	10987	11	170	167.8	14.3	1770
83	CARGO	$0.62	8288	13	170	167.8	14.3	1770
83	CARGO	$4.20	14300	9	170	167.8	14.3	1770
83	CARGO	$4.20	15099	8	170	167.8	14.3	1770
83	CARGO	$3.90	31841	12	170	167.8	14.3	1770
83	CARGO	$3.90	31841	12	170	167.8	14.3	1770
83	CARGO	$1.00	11371	13	170	167.8	14.3	1770
83	CARGO	$2.60	11897	7	170	167.8	14.3	1770
83	CARGO	$7.50	15721	2	170	167.8	14.3	1770
83	CARGO	$1.30	7476	10	170	167.8	14.3	1770
83	CARGO	$8.50	22050	6	170	167.8	14.3	1770
84	CARGO	$0.68	3377	13	173	168.1	14.2	1912
84	CARGO	$1.50	11647	14	173	168.1	14.2	1912
84	CARGO	$2.10	15139	13	173	168.1	14.2	1912
84	CARGO	$1.30	12726	14	173	168.1	14.2	1912
84	CARGO	$2.25	16008	12	173	168.1	14.2	1912
84	CARGO	$1.70	11599	9	173	168.1	14.2	1912
84	CARGO	$2.85	15460	11	173	168.1	14.2	1912
84	CARGO	$4.90	18400	6	173	168.1	14.2	1912
84	CARGO	$3.00	5385	5	173	168.1	14.2	1912
84	CARGO	$1.60	15291	15	173	168.1	14.2	1912
84	CARGO	$6.00	15120	5	173	168.1	14.2	1912
84	CARGO	$6.00	15210	5	173	168.1	14.2	1912
84	CARGO	$3.25	20950	8	173	168.1	14.2	1912
84	CARGO	$3.25	20950	8	173	168.1	14.2	1912
84	CARGO	$0.76	14466	16	173	168.1	14.2	1912
84	CARGO	$1.00	7745	14	173	168.1	14.2	1912
84	CARGO	$1.10	15094	14	173	168.1	14.2	1912
84	CARGO	$0.80	11049	12	173	168.1	14.2	1912
84	CARGO	$1.20	6200	8	173	168.1	14.2	1912
84	CARGO	$2.50	13447	8	173	168.1	14.2	1912
85	CARGO	$0.50	15480	16	167	168.0	13.9	1923
85	CARGO	$1.00	19017	13	167	168.0	13.9	1923
85	CARGO	$1.95	6081	6	167	168.0	13.9	1923
85	CARGO	$1.85	5900	6	167	168.0	13.9	1923
85	CARGO	$0.93	14992	12	167	168.0	13.9	1923
85	CARGO	$0.40	15480	16	167	168.0	13.9	1923
85	CARGO	$0.40	15480	16	167	168.0	13.9	1923
85	CARGO	$2.75	15255	9	167	168.0	13.9	1923
85	CARGO	$2.75	15255	8	167	168.0	13.9	1923
85	CARGO	$0.95	11585	11	167	168.0	13.9	1923
85	CARGO	$0.70	11603	14	167	168.0	13.9	1923
85	CARGO	$1.50	18421	8	167	168.0	13.9	1923

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
85	CARGO	$1.30	9637	12	167	168.0	13.9	1923
85	CARGO	$1.40	12281	13	167	168.0	13.9	1923
85	CARGO	$1.40	17449	9	167	168.0	13.9	1923
85	CARGO	$0.85	10077	11	167	168.0	13.9	1923
85	CARGO	$0.50	19016	13	167	168.0	13.9	1923
85	CARGO	$1.40	11679	9	167	168.0	13.9	1923
85	CARGO	$0.43	15266	16	167	168.0	13.9	1923
85	CARGO	$1.70	16213	9	167	168.0	13.9	1923
86	CARGO	$0.51	15241	16	158	164.9	13.4	1945
86	CARGO	$0.48	14924	17	158	164.9	13.4	1945
86	CARGO	$0.80	17449	10	158	164.9	13.4	1945
86	CARGO	$1.60	5210	7	158	164.9	13.4	1945
86	CARGO	$0.80	15107	12	158	164.9	13.4	1945
86	CARGO	$2.20	11300	11	158	164.9	13.4	1945
86	CARGO	$1.00	15067	10	158	164.9	13.4	1945
86	CARGO	$1.50	21103	12	158	164.9	13.4	1945
86	CARGO	$1.29	8034	5	158	164.9	13.4	1945
86	CARGO	$0.93	8161	4	158	164.9	13.4	1945
86	CARGO	$0.33	15180	16	158	164.9	13.4	1945
86	CARGO	$1.00	7654	13	158	164.9	13.4	1945
86	CARGO	$1.00	7630	14	158	164.9	13.4	1945
86	CARGO	$1.00	20949	10	158	164.9	13.4	1945
86	CARGO	$0.43	5438	16	158	164.9	13.4	1945
86	CARGO	$2.20	17152	8	158	164.9	13.4	1945
86	CARGO	$1.70	16925	9	158	164.9	13.4	1945
86	CARGO	$0.70	15251	12	158	164.9	13.4	1945
86	CARGO	$0.75	15902	14	158	164.9	13.4	1945
86	CARGO	$1.25	14841	9	158	164.9	13.4	1945
87	CARGO	$2.40	22260	7	174	163.5	13.8	1975
87	CARGO	$3.90	26987	5	174	163.5	13.8	1975
87	CARGO	$0.94	16901	13	174	163.5	13.8	1975
87	CARGO	$3.00	24270	10	174	163.5	13.8	1975
87	CARGO	$1.90	14827	6	174	163.5	13.8	1975
87	CARGO	$1.80	14566	10	174	163.5	13.8	1975
87	CARGO	$4.80	21793	9	174	163.5	13.8	1975
87	CARGO	$0.60	15139	15	174	163.5	13.8	1975
87	CARGO	$1.35	15909	9	174	163.5	13.8	1975
87	CARGO	$1.74	2811	9	174	163.5	13.8	1975
87	CARGO	$1.10	14937	16	174	163.5	13.8	1975
87	CARGO	$1.28	15259	12	174	163.5	13.8	1975
87	CARGO	$1.20	15106	15	174	163.5	13.8	1975
87	CARGO	$0.64	7112	14	174	163.5	13.8	1975
87	CARGO	$0.68	7093	12	174	163.5	13.8	1975
87	CARGO	$3.00	15767	9	174	163.5	13.8	1975

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
87	CARGO	$7.00	20441	7	174	163.5	13.8	1975
87	CARGO	$1.20	10056	12	174	163.5	13.8	1975
87	CARGO	$0.43	2689	17	174	163.5	13.8	1975
87	CARGO	$2.10	16570	13	174	163.5	13.8	1975
88	CARGO	$1.50	15174	17	195	161.9	14.0	
88	CARGO	$1.65	16700	17	195	161.9	14.0	
88	CARGO	$3.75	16120	11	195	161.9	14.0	
88	CARGO	$1.70	1540	15	195	161.9	14.0	
88	CARGO	$1.00	7435	17	195	161.9	14.0	
88	CARGO	$3.50	15079	13	195	161.9	14.0	
88	CARGO	$2.10	15057	15	195	161.9	14.0	
88	CARGO	$2.70	17257	15	195	161.9	14.0	
88	CARGO	$5.70	26568	11	195	161.9	14.0	
88	CARGO	$3.70	20144	15	195	161.9	14.0	
88	CARGO	$3.40	16901	14	195	161.9	14.0	
88	CARGO	$2.70	7173	12	195	161.9	14.0	
88	CARGO	$2.70	7114	6	195	161.9	14.0	
88	CARGO	$4.20	15166	15	195	161.9	14.0	
88	CARGO	$4.30	20335	11	195	161.9	14.0	
88	CARGO	$4.05	15163	11	195	161.9	14.0	
88	CARGO	$1.80	16030	18	195	161.9	14.0	
88	CARGO	$8.50	17800	10	195	161.9	14.0	
88	CARGO	$4.05	15196	11	195	161.9	14.0	
88	CARGO	$3.00	16055	14	195	161.9	14.0	
89	CARGO	$2.10	7875	16				
89	CARGO	$3.80	16270	16				
89	CARGO	$10.50	21031	12				
89	CARGO	$6.50	16291	13				
89	CARGO	$6.50	19205	13				
89	CARGO	$1.80	7554	19				
89	CARGO	$5.00	16570	14				
89	CARGO	$4.00	14900	13				
89	CARGO	$4.00	14900	13				
89	CARGO	$5.80	15767	11				
89	CARGO	$9.00	20850	10				
89	CARGO	$3.90	11757	12				
89	CARGO	$3.00	8001	16				
89	CARGO	$9.00	26568	12				
89	CARGO	$2.30	15139	18				
89	CARGO	$2.50	16158	20				
89	CARGO	$8.60	7954	9				
89	CARGO	$5.70	16582	12				
89	CARGO	$3.20	11589	14				
89	CARGO	$1.70	15153	17				

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
77	TANKER	$5.00	75675	12	72	335.3	9.1	1898
77	TANKER	$1.20	61074	13	72	335.3	9.1	1898
77	TANKER	$8.00	210257	9	72	335.3	9.1	1898
77	TANKER	$5.20	195119	9	72	335.3	9.1	1898
77	TANKER	$9.30	72346	4	72	335.3	9.1	1898
77	TANKER	$40.00	499933	1	72	335.3	9.1	1898
77	TANKER	$14.00	86899	2	72	335.3	9.1	1898
77	TANKER	$14.00	86899	2	72	335.3	9.1	1898
77	TANKER	$6.00	98912	8	72	335.3	9.1	1898
77	TANKER	$9.80	140450	5	72	335.3	9.1	1898
77	TANKER	$3.25	96981	10	72	335.3	9.1	1898
77	TANKER	$17.40	272491	4	72	335.3	9.1	1898
77	TANKER	$10.80	216675	7	72	335.3	9.1	1898
77	TANKER	$3.20	103929	13	72	335.3	9.1	1898
77	TANKER	$10.00	209407	8	72	335.3	9.1	1898
77	TANKER	$3.00	44901	14	72	335.3	9.1	1898
77	TANKER	$3.40	75675	12	72	335.3	9.1	1898
77	TANKER	$12.50	140778	3	72	335.3	9.1	1898
77	TANKER	$5.50	93735	10	72	335.3	9.1	1898
77	TANKER	$1.00	70801	12	72	335.3	9.1	1898
78	TANKER	$5.00	18785	4	97	339.1	9.5	1949
78	TANKER	$0.85	53207	15	97	339.1	9.5	1949
78	TANKER	$9.60	249261	5	97	339.1	9.5	1949
78	TANKER	$7.75	80000	3	97	339.1	9.5	1949
78	TANKER	$2.60	82462	13	97	339.1	9.5	1949
78	TANKER	$11.50	138373	4	97	339.1	9.5	1949
78	TANKER	$13.30	32240	2	97	339.1	9.5	1949
78	TANKER	$22.00	372217	3	97	339.1	9.5	1949
78	TANKER	$2.05	110241	10	97	339.1	9.5	1949
78	TANKER	$14.10	40200	2	97	339.1	9.5	1949
78	TANKER	$2.05	110241	10	97	339.1	9.5	1949
78	TANKER	$0.60	20913	17	97	339.1	9.5	1949
78	TANKER	$0.80	21215	18	97	339.1	9.5	1949
78	TANKER	$7.50	232979	5	97	339.1	9.5	1949
78	TANKER	$3.25	61471	15	97	339.1	9.5	1949
78	TANKER	$1.50	21469	16	97	339.1	9.5	1949
78	TANKER	$4.25	231912	9	97	339.1	9.5	1949
78	TANKER	$6.00	133559	8	97	339.1	9.5	1949
78	TANKER	$25.50	362118	3	97	339.1	9.5	1949
78	TANKER	$0.55	16117	18	97	339.1	9.5	1949
79	TANKER	$4.50	209407	10	89	338.3	9.9	2038
79	TANKER	$3.15	62212	15	89	338.3	9.9	2038
79	TANKER	$14.00	140999	5	89	338.3	9.9	2038
79	TANKER	$1.30	13816	18	89	338.3	9.9	2038

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
79	TANKER	$0.80	20457	18	89	338.3	9.9	2038
79	TANKER	$3.20	20457	18	89	338.3	9.9	2038
79	TANKER	$13.50	140999	5	89	338.3	9.9	2038
79	TANKER	$15.50	38414	10	89	338.3	9.9	2038
79	TANKER	$15.50	38414	10	89	338.3	9.9	2038
79	TANKER	$2.20	70211	6	89	338.3	9.9	2038
79	TANKER	$16.00	32395	2	89	338.3	9.9	2038
79	TANKER	$3.75	55394	15	89	338.3	9.9	2038
79	TANKER	$8.00	220050	9	89	338.3	9.9	2038
79	TANKER	$15.00	40200	3	89	338.3	9.9	2038
79	TANKER	$5.00	181879	10	89	338.3	9.9	2038
79	TANKER	$13.15	32737	9	89	338.3	9.9	2038
79	TANKER	$13.15	32737	8	89	338.3	9.9	2038
79	TANKER	$13.15	32737	6	89	338.3	9.9	2038
79	TANKER	$7.50	111302	12	89	338.3	9.9	2038
79	TANKER	$4.25	96842	15	89	338.3	9.9	2038
80	TANKER	$20.00	92134	5	71	339.8	10.4	1871
80	TANKER	$15.00	32531	7	71	339.8	10.4	1871
80	TANKER	$15.00	32531	7	71	339.8	10.4	1871
80	TANKER	$9.20	23674	13	71	339.8	10.4	1871
80	TANKER	$29.00	132207	1	71	339.8	10.4	1871
80	TANKER	$7.00	63172	15	71	339.8	10.4	1871
80	TANKER	$7.30	95529	15	71	339.8	10.4	1871
80	TANKER	$27.00	224336	7	71	339.8	10.4	1871
80	TANKER	$21.00	139340	6	71	339.8	10.4	1871
80	TANKER	$7.80	11788	10	71	339.8	10.4	1871
80	TANKER	$4.50	53280	18	71	339.8	10.4	1871
80	TANKER	$15.00	28574	4	71	339.8	10.4	1871
80	TANKER	$18.50	96550	4	71	339.8	10.4	1871
80	TANKER	$12.50	133559	10	71	339.8	10.4	1871
80	TANKER	$16.50	29087	5	71	339.8	10.4	1871
80	TANKER	$16.00	60091	7	71	339.8	10.4	1871
80	TANKER	$9.00	218813	9	71	339.8	10.4	1871
80	TANKER	$13.00	79078	6	71	339.8	10.4	1871
80	TANKER	$6.80	100588	12	71	339.8	10.4	1871
80	TANKER	$6.30	75560	14	71	339.8	10.4	1871
81	TANKER	$6.90	217616	11	47	335.5	10.6	1693
81	TANKER	$6.50	75850	14	47	335.5	10.6	1693
81	TANKER	$7.30	102092	13	47	335.5	10.6	1693
81	TANKER	$10.00	260158	7	47	335.5	10.6	1693
81	TANKER	$3.50	51929	18	47	335.5	10.6	1693
81	TANKER	$3.20	80351	16	47	335.5	10.6	1693
81	TANKER	$3.10	70861	15	47	335.5	10.6	1693
81	TANKER	$4.25	139528	13	47	335.5	10.6	1693

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
81	TANKER	$18.50	87813	6	47	335.5	10.6	1693
81	TANKER	$12.25	278219	6	47	335.5	10.6	1693
81	TANKER	$5.00	14428	14	47	335.5	10.6	1693
81	TANKER	$6.85	16071	7	47	335.5	10.6	1693
81	TANKER	$10.35	257059	9	47	335.5	10.6	1693
81	TANKER	$3.00	99308	15	47	335.5	10.6	1693
81	TANKER	$2.40	59195	17	47	335.5	10.6	1693
81	TANKER	$4.15	219014	11	47	335.5	10.6	1693
81	TANKER	$3.75	259471	11	47	335.5	10.6	1693
81	TANKER	$1.90	77541	16	47	335.5	10.6	1693
81	TANKER	$2.50	46459	18	47	335.5	10.6	1693
81	TANKER	$4.60	24821	12	47	335.5	10.6	1693
82	TANKER	$8.00	117710	10	43	325.2	11.1	1480
82	TANKER	$13.50	250874	7	43	325.2	11.1	1480
82	TANKER	$1.73	63147	18	43	325.2	11.1	1480
82	TANKER	$1.73	59032	18	43	325.2	11.1	1480
82	TANKER	$3.25	219998	15	43	325.2	11.1	1480
82	TANKER	$3.50	258603	11	43	325.2	11.1	1480
82	TANKER	$1.30	49631	17	43	325.2	11.1	1480
82	TANKER	$4.20	144148	7	43	325.2	11.1	1480
82	TANKER	$3.50	131813	10	43	325.2	11.1	1480
82	TANKER	$12.90	89940	6	43	325.2	11.1	1480
82	TANKER	$3.80	239604	9	43	325.2	11.1	1480
82	TANKER	$4.70	139137	9	43	325.2	11.1	1480
82	TANKER	$2.80	263383	5	43	325.2	11.1	1480
82	TANKER	$7.00	126997	7	43	325.2	11.1	1480
82	TANKER	$2.50	222375	11	43	325.2	11.1	1480
82	TANKER	$1.50	67594	17	43	325.2	11.1	1480
82	TANKER	$19.20	132250	6	43	325.2	11.1	1480
82	TANKER	$3.80	60301	9	43	325.2	11.1	1480
82	TANKER	$7.50	224850	11	43	325.2	11.1	1480
82	TANKER	$17.00	82253	0	43	325.2	11.1	1480
83	TANKER	$1.10	220300	13	46	306.1	10.3	1461
83	TANKER	$6.10	36266	7	46	306.1	10.3	1461
83	TANKER	$3.70	240827	8	46	306.1	10.3	1461
83	TANKER	$1.60	20977	18	46	306.1	10.3	1461
83	TANKER	$3.60	240827	7	46	306.1	10.3	1461
83	TANKER	$2.80	137160	9	46	306.1	10.3	1461
83	TANKER	$4.15	277108	9	46	306.1	10.3	1461
83	TANKER	$3.60	117909	11	46	306.1	10.3	1461
83	TANKER	$5.55	343423	5	46	306.1	10.3	1461
83	TANKER	$4.00	14496	9	46	306.1	10.3	1461
83	TANKER	$2.70	34622	17	46	306.1	10.3	1461
83	TANKER	$3.50	137160	8	46	306.1	10.3	1461

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
83	TANKER	$4.10	269195	6	46	306.1	10.3	1461
83	TANKER	$4.00	318754	8	46	306.1	10.3	1461
83	TANKER	$6.30	127002	8	46	306.1	10.3	1461
83	TANKER	$7.60	26909	9	46	306.1	10.3	1461
83	TANKER	$10.00	145649	8	46	306.1	10.3	1461
83	TANKER	$5.60	269709	9	46	306.1	10.3	1461
83	TANKER	$1.55	64805	20	46	306.1	10.3	1461
83	TANKER	$3.50	227604	12	46	306.1	10.3	1461
84	TANKER	$14.00	54999	9	48	286.8	10.7	1498
84	TANKER	$10.00	232750	8	48	286.8	10.7	1498
84	TANKER	$5.00	236807	10	48	286.8	10.7	1498
84	TANKER	$6.00	32737	13	48	286.8	10.7	1498
84	TANKER	$5.00	221597	2	48	286.8	10.7	1498
84	TANKER	$5.60	236807	10	48	286.8	10.7	1498
84	TANKER	$5.50	318754	9	48	286.8	10.7	1498
84	TANKER	$6.00	392543	8	48	286.8	10.7	1498
84	TANKER	$4.30	97886	13	48	286.8	10.7	1498
84	TANKER	$1.70	50904	20	48	286.8	10.7	1498
84	TANKER	$7.50	83986	10	48	286.8	10.7	1498
84	TANKER	$3.60	21321	15	48	286.8	10.7	1498
84	TANKER	$9.00	140905	10	48	286.8	10.7	1498
84	TANKER	$15.00	491120	6	48	286.8	10.7	1498
84	TANKER	$5.60	323114	8	48	286.8	10.7	1498
84	TANKER	$3.50	36402	11	48	286.8	10.7	1498
84	TANKER	$8.50	32046	10	48	286.8	10.7	1498
84	TANKER	$3.71	30294	12	48	286.8	10.7	1498
84	TANKER	$2.65	56685	18	48	286.8	10.7	1498
84	TANKER	$6.50	229945	8	48	286.8	10.7	1498
85	TANKER	$7.50	232369	11	41	268.4	11.3	1459
85	TANKER	$0.70	25067	17	41	268.4	11.3	1459
85	TANKER	$4.00	133725	14	41	268.4	11.3	1459
85	TANKER	$3.50	150761	14	41	268.4	11.3	1459
85	TANKER	$6.50	31600	10	41	268.4	11.3	1459
85	TANKER	$1.65	71152	19	41	268.4	11.3	1459
85	TANKER	$2.00	50995	20	41	268.4	11.3	1459
85	TANKER	$15.00	39723	1	41	268.4	11.3	1459
85	TANKER	$15.00	39723	2	41	268.4	11.3	1459
85	TANKER	$10.20	39750	3	41	268.4	11.3	1459
85	TANKER	$2.75	32212	10	41	268.4	11.3	1459
85	TANKER	$5.50	421681	9	41	268.4	11.3	1459
85	TANKER	$5.60	388119	9	41	268.4	11.3	1459
85	TANKER	$4.20	83258	11	41	268.4	11.3	1459
85	TANKER	$4.20	83365	12	41	268.4	11.3	1459
85	TANKER	$5.80	64487	5	41	268.4	11.3	1459

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
85	TANKER	$4.25	90995	9	41	268.4	11.3	1459
85	TANKER	$3.65	89702	10	41	268.4	11.3	1459
85	TANKER	$6.00	31650	6	41	268.4	11.3	1459
85	TANKER	$8.75	81561	5	41	268.4	11.3	1459
86	TANKER	$5.10	392798	11	50	247.5	11.9	1533
86	TANKER	$6.75	372201	12	50	247.5	11.9	1533
86	TANKER	$4.00	77102	11	50	247.5	11.9	1533
86	TANKER	$4.15	83466	11	50	247.5	11.9	1533
86	TANKER	$6.50	323092	7	50	247.5	11.9	1533
86	TANKER	$5.10	392798	11	50	247.5	11.9	1533
86	TANKER	$7.00	155505	9	50	247.5	11.9	1533
86	TANKER	$6.50	232164	11	50	247.5	11.9	1533
86	TANKER	$4.60	87801	11	50	247.5	11.9	1533
86	TANKER	$2.60	102913	16	50	247.5	11.9	1533
86	TANKER	$10.60	85992	5	50	247.5	11.9	1533
86	TANKER	$9.60	290762	12	50	247.5	11.9	1533
86	TANKER	$1.80	25001	8	50	247.5	11.9	1533
86	TANKER	$2.60	21104	17	50	247.5	11.9	1533
86	TANKER	$7.20	60951	12	50	247.5	11.9	1533
86	TANKER	$3.08	22610	15	50	247.5	11.9	1533
86	TANKER	$4.00	112627	17	50	247.5	11.9	1533
86	TANKER	$2.50	101997	19	50	247.5	11.9	1533
86	TANKER	$2.50	101977	18	50	247.5	11.9	1533
86	TANKER	$15.20	357023	9	50	247.5	11.9	1533
87	TANKER	$11.40	61335	6	62	245.5	12.2	1530
87	TANKER	$9.75	138930	11	62	245.5	12.2	1530
87	TANKER	$9.00	134372	12	62	245.5	12.2	1530
87	TANKER	$1.05	4168	18	62	245.5	12.2	1530
87	TANKER	$4.00	31120	13	62	245.5	12.2	1530
87	TANKER	$1.85	19813	20	62	245.5	12.2	1530
87	TANKER	$4.10	30243	18	62	245.5	12.2	1530
87	TANKER	$6.50	40200	11	62	245.5	12.2	1530
87	TANKER	$10.25	81283	7	62	245.5	12.2	1530
87	TANKER	$8.50	59250	10	62	245.5	12.2	1530
87	TANKER	$9.70	62381	12	62	245.5	12.2	1530
87	TANKER	$9.00	38851	19	62	245.5	12.2	1530
87	TANKER	$6.00	215925	16	62	245.5	12.2	1530
87	TANKER	$9.66	124264	13	62	245.5	12.2	1530
87	TANKER	$4.60	9064	4	62	245.5	12.2	1530
87	TANKER	$4.20	97176	15	62	245.5	12.2	1530
87	TANKER	$12.00	39258	7	62	245.5	12.2	1530
87	TANKER	$6.40	269195	10	62	245.5	12.2	1530
87	TANKER	$16.20	319226	11	62	245.5	12.2	1530
87	TANKER	$4.50	104447	19	62	245.5	12.2	1530

YR SOLD	SHIP TYPE	PRICE MILLIONS	DWT	AGE AT SALE	AVG FGHT RATE	TOTAL FLEET SIZE	AVG AGE	TRADE VOLUME MIL.TON
88	TANKER	$9.80	227401	17	68	245.0	12.4	
88	TANKER	$14.25	87301	8	68	245.0	12.4	
88	TANKER	$14.00	87355	8	68	245.0	12.4	
88	TANKER	$7.20	138291	16	68	245.0	12.4	
88	TANKER	$2.70	7057	13	68	245.0	12.4	
88	TANKER	$14.50	239726	12	68	245.0	12.4	
88	TANKER	$11.00	258282	16	68	245.0	12.4	
88	TANKER	$6.10	29687	14	68	245.0	12.4	
88	TANKER	$16.80	300078	11	68	245.0	12.4	
88	TANKER	$12.00	173847	12	68	245.0	12.4	
88	TANKER	$20.50	89943	14	68	245.0	12.4	
88	TANKER	$7.50	32755	13	68	245.0	12.4	
88	TANKER	$16.10	84464	7	68	245.0	12.4	
88	TANKER	$5.40	35621	13	68	245.0	12.4	
88	TANKER	$5.40	35621	13	68	245.0	12.4	
88	TANKER	$9.70	81296	14	68	245.0	12.4	
88	TANKER	$12.50	128303	14	68	245.0	12.4	
88	TANKER	$5.60	21214	14	68	245.0	12.4	
88	TANKER	$12.60	125882	14	68	245.0	12.4	
88	TANKER	$15.10	38629	7	68	245.0	12.4	
89	TANKER	$15.10	123699	14				
89	TANKER	$10.50	39105	13				
89	TANKER	$15.30	140743	14				
89	TANKER	$8.00	32214	14				
89	TANKER	$17.90	63797	8				
89	TANKER	$8.00	32116	14				
89	TANKER	$15.00	25200	15				
89	TANKER	$13.30	66726	10				
89	TANKER	$13.30	66726	10				
89	TANKER	$9.50	59487	13				
89	TANKER	$8.50	82030	20				
89	TANKER	$20.00	81279	8				
89	TANKER	$21.00	130257	14				
89	TANKER	$13.00	26328	7				
89	TANKER	$13.00	26328	7				
89	TANKER	$10.50	25300	15				
89	TANKER	$10.50	25200	15				
89	TANKER	$26.50	86966	8				
89	TANKER	$25.50	54131	8				
89	TANKER	$28.50	81279	6				

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